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Forest Owners and Timber Management in Michigan

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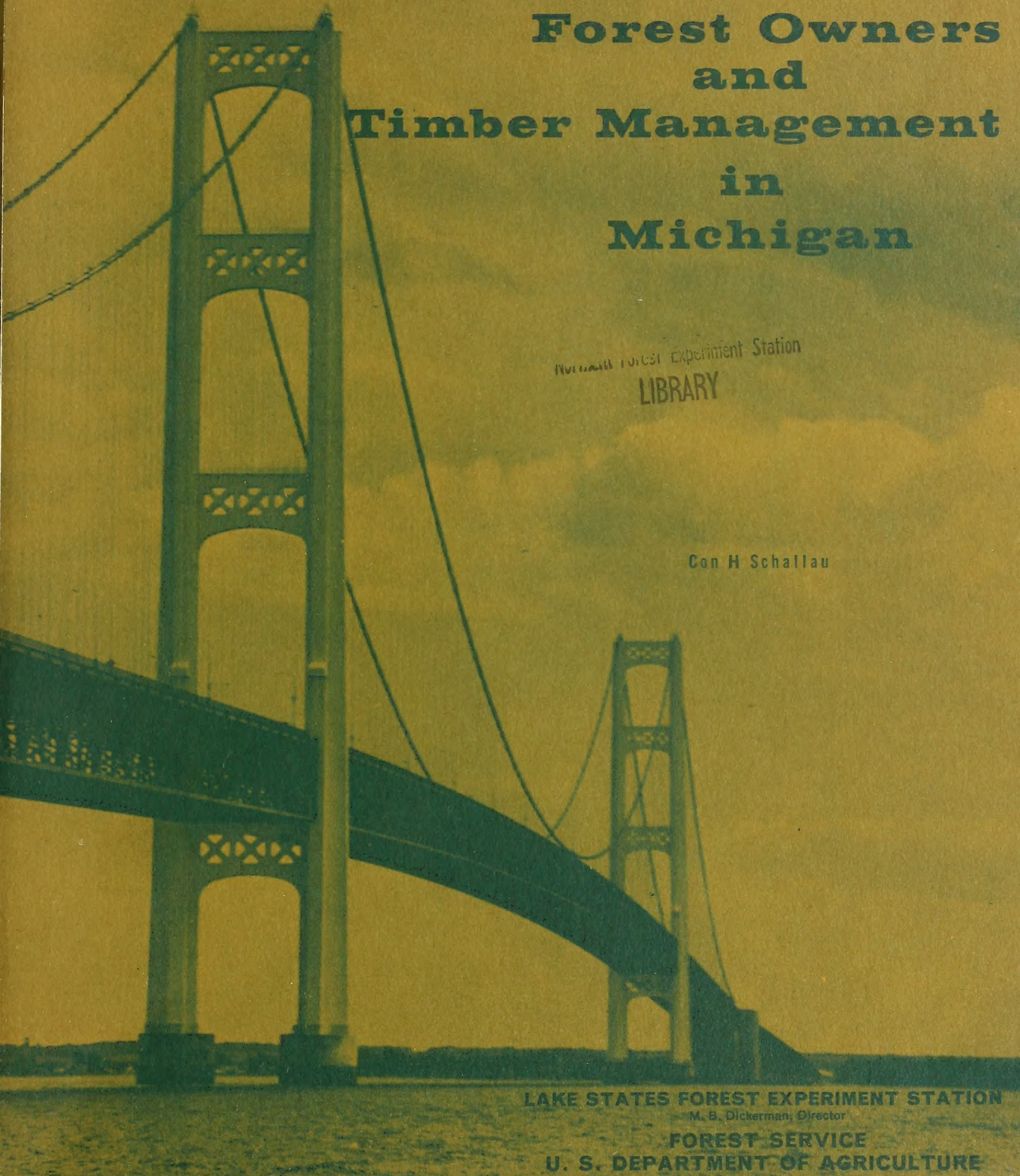
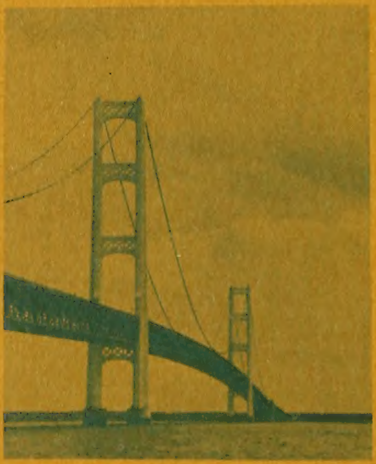


LAKE STATES FOREST EXPERIMENT STATION
M. B. Dickerman, Director
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

FOREWORD

The responsibility for managing the 51.6 million acres of commercial forest land in the Lake States region is divided among three major ownership classes: (1) public, (2) "large private," that is, individuals and corporations having more than 5,000 acres, and (3) private individuals and corporations owning less than 5,000 acres. Ownership research at the Lake States Station has dealt mainly with the latter group — the "small ownerships." This report is unique in that it discusses public and large private ownerships as well as the small ownerships.

The author is indebted to numerous individuals for their help in preparing this paper. He is especially grateful for the assistance of the staffs of the Forestry Division of the Michigan Department of Conservation, Lansing, Mich., and the U.S. Forest Service's North Central Region office, Milwaukee, Wis. Drs. Dean N. Quinney, Lake States Forest Experiment Station, and James G. Yoho, School of Forestry, Duke University, are thanked for granting permission to abstract liberally from unpublished results but are not implicated by the author's use.



Majestic Mackinac Bridge linking the wooded shorelines of Michigan's two Peninsulas. Providing a convenient vacation route to the North Country, this bridge should stimulate increased use of Michigan's forest recreational facilities. (Photo courtesy of Michigan's Tourist Council.)

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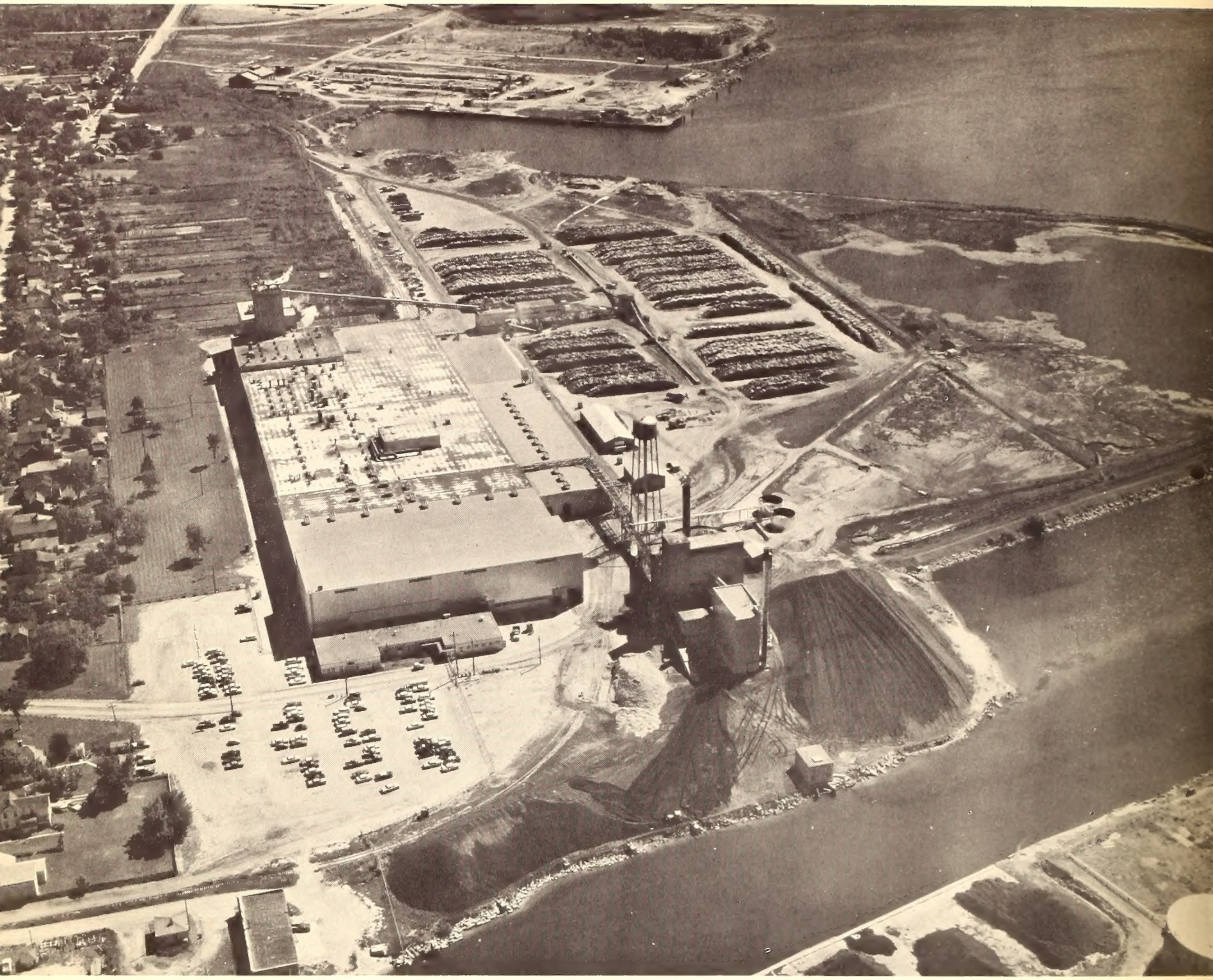

FIGURE 1. — Abitibi Corporation's new modern pulpmill at Alpena. Although lumber was once the major product from Michigan's forests, it was surpassed by pulpwood products during the 1950's. (Photo courtesy of Hunting Survey Corporation Limited, Toronto, Canada.)

INTRODUCTION

Use of Michigan's forests began shortly after the pioneers started to move westward beyond the Appalachians. Settlement of Michigan began in earnest after the opening of the Erie Canal in 1825. The first settlers were interested in farming, and since the State was almost entirely forested they faced a formidable land-clearing job. Small sawmills sprang up all over southern Michigan to supply lumber for building, but despite this use the forests were considered a hindrance. Much of the original forest cover in southern Michigan was windrowed and burned to make way for agricultural production.

The original forests in Michigan contained roughly 380 billion board feet of sawtimber (Sparhawk 1929, p. 6).[1] This is more than 15 times the present sawtimber volume. Although there was some early hardwood logging in southern Michigan, it was the pine forest of the Saginaw Valley, the Thumb area, and, a little later on, areas farther north that made Michigan famous as a midwestern lumber producer. Increased demand from eastern markets and the settlement of the Prairie States provided the impetus for the rapid growth of the pine lumber industry in Michigan after 1850.

Early loggers harvested timber as if the supply were unlimited. Subsequently they were proven wrong because, as the tabulation below shows, the expansion of Michigan's lumber industry was relatively short-lived.

Year	*Billion bd. ft. of lumber produced*
1870	2.4
1880	4.3
1890	5.2
1900	2.8
1910	1.8
1920	.8
1930	.5
1940	.4
1950	.5
1960	.3

Source: Bureau of the Census records

The peak year for lumber production was 1889 when 5.4 billion board feet were produced. Michigan led the Nation in lumber production for 30 years, but by the turn of the century lumber barons were starting to move to the South and West where sawtimber supplies were more abundant (fig. 1). Michigan's original supply of pine had nearly been exhausted. By 1925 it ranked 25th in the Nation in lumber production.

Although most of the original timber volume was harvested for lumber and other wood products, much went up in smoke. Sparhawk (1929, p. 9) has estimated that 35 billion board feet were cut and burned in clearing land for farms. An additional 73 billion feet were burned during or after lumbering, or were destroyed by forest fires independent of cutting operations. The removal of forest cover was considered beneficial at the time since farming was expected to thrive in the cutover areas of Michigan.

Actually the farmers did fairly well as long as the lumber industry prospered, but with its decline the farms encountered hard times. Realization that much of Michigan's cutover area was unsuitable for agriculture led to the collapse of the land boom in the 1920's. Widespread tax forfeiture of cutover and burned-over forest land followed. Subsequent increases in property taxes and the economic depression of the 1930's caused more land to be forfeited. Although Michigan's State and National Forest systems date back to the early 1900's, much of their growth can be attributed to the abandonment of these "unwanted" lands.

In 1920 nearly all of Michigan's forest resources were in private hands, but since then the situation has changed. A third of the commercial forest land in the State is now publicly owned (table 1).

But during the decades since 1920 Michigan's forest resources have undergone other changes besides those in ownership patterns. Pine lumbering was nearly finished, but logging continued to

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[1] *Names and dates in parentheses refer to Literature Cited at the end of this report.*

Note: The author is a Forest Economist at the Lake States Forest Experiment Station. The Station is maintained at St. Paul, Minnesota by the Forest Service, U.S. Department of Agriculture, in cooperation with the University of Minnesota.

TABLE 1. — *Commercial forest land, by ownership and region, Michigan, 1955 (after Findell et al. 1960)*

(In thousands of acres)

Owner	Upper Peninsula	Lower Peninsula		State
		North half	South half	
Federal	1,709	805	16	2,530
State	1,796	1,780	119	3,695
County and municipal	54	20	11	85
Private	5,480	4,903	2,428	12,811
All owners	9,039	7,508	2,574	19,121

reduce timber volumes for several decades. Cutting of the slow-growing, mature hardwood and hemlock forests in the Upper Peninsula accounted for much of this reduction. The total growing stock volume probably reached an all-time low during the mid-1940's and has now climbed to a pre-1935 level as shown below:

Year	*Growing stock volume (billion cu. ft.)*	*Sawtimber volume (billion bd. ft.)*
1935	10.4	26.3
1945	8.2	19.0
1955	10.7	23.8

Source: Forest Survey statistics

The "thickening up" of the forests can be attributed to hardwood cordwood growth since softwood growing stock and sawtimber volume had dropped 27 percent and 34 percent respectively since 1935. Sawtimber volume of all species was greater in 1955 than in 1945 but was still less than in 1935.

Present stocking of Michigan forest land is only a fraction of what it once supported. Just as an example, Gevorkiantz and Duerr (1937) estimated that typical old-growth northern hardwood stands in the Upper Peninsula ran from 2,000 to 3,000 cubic feet of growing stock per acre at 100 years. Average stocking of second-growth northern hardwood stands in 1955 was approximately 500 cubic feet per acre. Although it may not be economically desirable to again maintain growing stock at such high levels (the original stands were overmature and growth was negligible), the comparison indicates that the level of stocking could be increased considerably. Whether it actually will be increased is partially dependent upon the efforts of forest-land owners to institute better management practices in the near future.

This report describes the levels of timber management being carried out by Michigan's private and public forest-land owners and speculates on the implications of such efforts in terms of future timber supplies. More specifically this report —

1. Shows who the various types of forest-land owners are, how much forest land they own, and how they manage their forest land and market their timber products.
2. Describes factors that inhibit the adoption of more productive management practices by certain classes of owners.
3. Assesses the effectiveness of various public assistance programs in promoting certain forestry practices among woodland owners.
4. Evaluates the trend of timber products output from Michigan's forest land in the light of the types of management practices (or lack of them) adopted by the various classes of owners.

The results of the study are divided into three major sections: (1) the small private forest-land ownerships; (2) the large private forest-land ownerships; and (3) the public forests. Emphasis is on the small ownerships, but the large ownerships and public forests are included to place the others in better perspective.

SOURCE OF DATA

The section on small private owners summarizes three small forest-land ownership studies conducted during the 5-year period 1954-59. Two of these studies (one for the Upper Peninsula and the other for the southern half of the Lower Peninsula) were made by the Lake States Forest Experiment Station (Quinney 1962, Schallau 1962). The Station cooperated with Michigan State University in making the third study which encompassed the northern half of the Lower Peninsula (Yoho et al. 1957, Yoho and James 1958).

The three small woodland ownership studies involved sampling from a very large population of individuals. Approximately 182,000 forest-land owners in Michigan have from 3 acres to 5,000 acres of forest land; of these, 634 were interviewed (198 in the Upper Peninsula and 229 in the northern half and 207 in the southern half of the Lower Peninsula). Details of the sampling schemes used in these studies can be obtained from the individual reports. It should be pointed out here that in the study of the northern half of the Lower Peninsula a slightly different population was sampled; *all* private owners were considered. The other two studies considered only those private owners with 5,000 acres or less of forest land. This does introduce some bias, but because the sampling rate was very low and the total number of large owners in the northern half of the Lower Peninsula is relatively small, the bias was judged to be unimportant.

Information used in the discussion of management of large private ownerships was obtained from public officials and published announcements rather than from the individual owners. The section on Michigan's public forest lands is based on data obtained from the Michigan Department of Conservation and from the U.S. Forest Service North Central Region office in Milwaukee, Wisconsin.

THE STUDY AREA

The State of Michigan can conveniently be divided into three geographical areas (fig. 2): (1) the Upper Peninsula, which is separated from the remainder of the State by the Straits of Mackinac, (2) the northern half of the Lower Peninsula, and (3) the southern half. These are the major subdivisions used in the Forest Survey of the State.

Michigan's population is concentrated in the southern half of the Lower Peninsula. Here 91 percent of the State's 7.8 million people reside. The remainder of the population is almost equally distributed between the other two subregions — 4 percent in the Upper Peninsula and 5 percent in the northern half of the Lower Peninsula. During the period between the 1950 and 1960 Censuses, Michigan's population increased by 22.3 percent or by nearly 1½ million people, mostly in southern Michigan. North of a line between Muskegon and Bay City, population increased by only 5.3 percent. In the area south of this line, the population rose

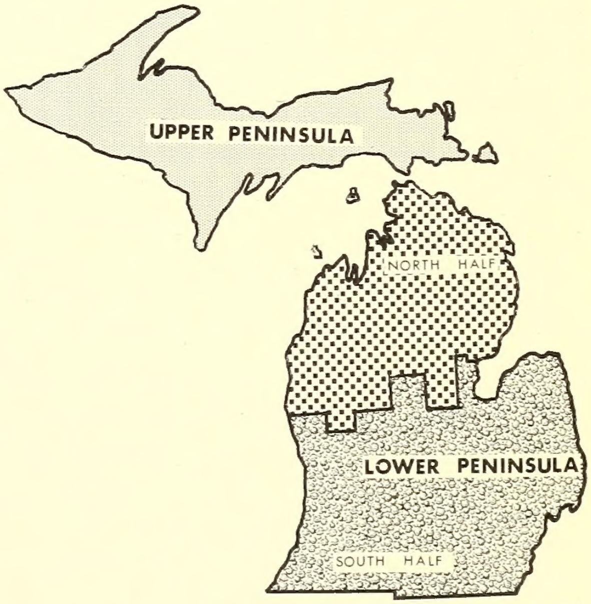

FIGURE 2. — Three geographical areas of Michigan.

by more than 24 percent. Outward migration and a lower birth rate are the reasons for the slower population growth in the northern counties.

Until the last decade the population of the Upper Peninsula was gradually decreasing after reaching an all-time peak in 1920. Actually, 3 of the Upper Peninsula's 15 counties accounted for most of the growth between 1950 and 1960, largely because of the enlargement of two military installations. Eight counties continued to show decreases in population.

The major part of Michigan's economy is located in the southern half of the Lower Peninsula. For instance, in terms of value added by manufacturing, that area accounted for 95 percent of the dollar value in 1958 while the Upper Peninsula and northern half of the Lower Peninsula supported only 1 percent and 4 percent respectively. The northern counties have a somewhat larger share of the number of farms than they do of the value added by manufacturing — 6 percent for the Upper Peninsula and 19 percent in the northern half of the Lower Peninsula. However, in terms of the value of agricultural products produced, the relationship is more like the value-added figures: 3 percent of the total in the Upper Peninsula, 12 percent in the northern half, and 85 percent in the southern half of the Lower Peninsula.

Unlike most other sectors of the State's economy, timber production is concentrated in the more northern counties, a reflection of the distribution of forest land. More than half of the State's forest area is located in the Upper Peninsula (table 2), which is 89 percent forested compared with only 17 percent in the southern half of the Lower Peninsula.

TABLE 2. — *Land areas, by major classes of land and Forest Survey district, Michigan, 1955*
(In acres)

Class of land	Upper Peninsula	Lower Peninsula North half	Lower Peninsula South half	State
Forest	9,409	7,651	2,639	19,699
Nonforest:				
Farm	634	2,463	10,332	13,429
Other	542	622	2,202	3,366
Total	10,585	10,736	15,173	36,494

As the tabulation below shows, the Upper Peninsula far surpasses the other two sections of the State in terms of the total value of rough forest products harvested (1954 data).

	Percent of total value
Upper Peninsula	61
North half of Lower Peninsula	20
South half of Lower Peninsula	19

Considering that the southern half of the Lower Peninsula is so heavily industrialized and populated and that much of the land area is in agricultural production, it makes a notable contribution to the State's forest economy. Although this area is only 17-percent forested it supplies nearly as much of Michigan's rough forest products, in terms of dollar value, as does the northern half of the Lower Peninsula, which is 71-percent forested. The reason lies in the type of timber product produced; in the northern half of the Lower Peninsula the major product is pulpwood, while higher per-unit-value hardwood sawtimber accounts for most of the cut from southern Michigan's forests. Furthermore, the southern half of the Lower Peninsula shows more potential for timber production on a per-acre basis. Annual net growth in cords per acre on commercial forest land was: 0.29 cord in western Upper Peninsula; 0.34 in eastern Upper Peninsula; 0.30 in northern Lower Peninsula, and 0.40 cord in southern Lower Peninsula.

Ownership of forest land in the Upper Peninsula and the northern half of the Lower Peninsula is quite similar (table 3). Public agencies own slightly more than a third of the forest land in both of these areas. Private ownership, on the other hand, accounts for all but 5 percent of the forest land in southern Michigan. Large private ownerships (over 5,000 acres in size) are quite prevalent in the Upper Peninsula, accounting for about one-half of the privately owned forest land. They account for only 4 percent of the total forest area in the northern half of the Lower Peninsula and practically none in the southern half.

Michigan's forests are thickening up, but the magnitude of the increases varies by ownership classes. For instance, growing stock volume on public forest land increased 55 percent between 1945 to 1955 — from 1.9 billion to 2.9 billion cubic

TABLE 3. — *Distribution of commercial forest area, by ownership and Forest Survey district, Michigan, 1955*

(In percent)

Ownership class	Upper Peninsula	Lower Peninsula		State
		North half	South half	
Public:				
Federal	19	11	*	13
State	20	24	5	19
Other public	*	*	*	*
Private:				
Large (over 5,000 acres)	29	4	*	15
Small (less than 5,000 acres)	32	61	95	53

* *Less than 0.5 percent.*

feet. Volume on private lands increased only 23 percent during the same period — from 6.3 to 7.8 billion cubic feet. Sawtimber volume on public lands increased from 1.8 to 5.6 billion board feet, or 211 percent between 1945 and 1955, while on private lands it rose 64 percent — from 17.1 to 18.2 billion board feet.

In addition to a faster increase in growing stock, public forest lands are supporting an ever-larger proportion of the total timber cut from Michigan's forests. In fact, while the total cut for the State dropped from 216 million cubic feet in 1950 to 178 million in 1960, the cut from both State and Federal lands was on the upswing. For instance, cut of growing stock from State forests was 4.6 million cubic feet in 1951 and 19.7 million in 1960. The cut from National Forests in Michigan was 6.0 million cubic feet in 1951 and 21.7 million in 1960. In 1950 public lands accounted for 7 percent of the State's cut from growing stock, while in 1960 the public land share had increased to 23 percent.

Several changes in land use trends during the post-war period will influence the State's future output of timber products (fig. 3). For one thing, the acreage of farmland is on the decline; according to the 1959 Census of Agriculture it dropped 14 percent during the 1949-59 period.[2] Some of this idle farmland may eventually revert to forest cover, especially in the northern sections of the State, but more importantly existence of idle farmland may reduce the tendency to clear forest land for agricultural purposes.

Another change in agricultural land use that will probably have a direct and immediate effect on timber production is the decline in the acreage of grazed woodlots. This decline, amounting to 47 percent between the 1949 and 1959 Censuses of Agriculture, should lead to an increase in quality as well as in quantity of timber being produced in Michigan.

In southern Michigan still another change in land use is occurring. This is the urban growth around the large metropolitan areas. Urbanization influences timber production by reducing the acreage of forest land. Indirectly it can reduce the economic supply of timber by isolating pockets of growing stock from timber marketing channels.

SMALL PRIVATE FOREST-LAND OWNERSHIPS

The 182,000 small forest-land ownerships (those of less than 5,000 acres of forest land) account for 53 percent of the total forest area in the State. Woodland owners[3] have been providing much of the State's timber products output during the past two or three decades and *could* be a major source of future supplies.

General Characteristics

The average size of ownership is 60 acres of forest land. However, the average is much smaller — 20 acres — for the 127,000 ownerships in the southern half of the Lower Peninsula, where wooded tracts generally occur on farms and represent a small portion of land that was never cleared for agriculture. Farther north where forest cover predominates, agricultural land, if present at all,

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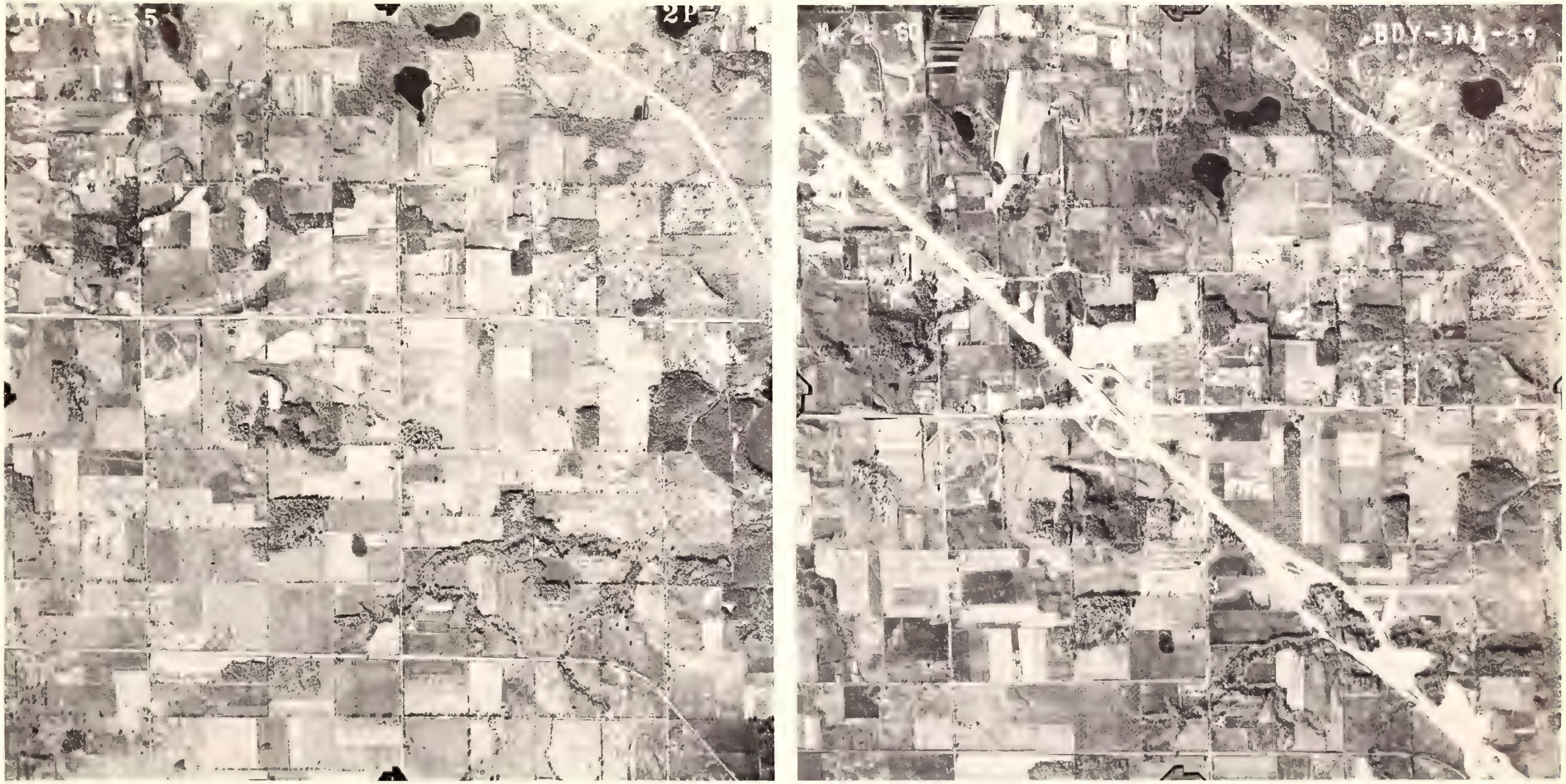
[2] *At the time of the last Census of Agriculture, over 200,000 acres of farmland had been retired under the Soil Bank Program. About 94 percent of this acreage involved whole farms and was not included in the 1959 enumeration. So participation in the Soil Bank Program led to about a 4-percent reduction in agricultural land.*

[3] *Throughout this paper the term "woodland owner" will be used only in reference to individuals possessing less than 5,000 acres of forest land.*

KENT COUNTY, MICHIGAN



1955

1960

Figure 3. — Rural land use changes in Michigan are often quite subtle. But there are times when the rural terrain is modified to a considerable extent. These two aerial photos, taken of approximately the same area at a 5-year interval, demonstrate how highway construction can greatly modify forest land. One woodlot shown (X) has been so dissected that it may never again support a timber harvest. (Photo courtesy U.S. Agricultural Stabilization and Conservation Service.)

usually accounts for a minor part of an individual ownership. Here the average size of ownership for the 55,000 woodland owners is 148 acres of forest land.

Although woodland owners are usually referred to in a collective manner, this ownership group represents a very diverse assortment. This can be shown by examining various characteristics such as occupation, length of tenure, age, and place of residency.

Owner's Occupation

Woodland owners show a variety of occupational backgrounds, with no single grouping comprising a majority (table 4). The farmer group (both full- and part-time) accounts for the largest amount of forest area, with the businessmen-professional owners running a close second.

Occupational patterns are fairly uniform throughout the State, but there are some significant differences. For instance, as one might expect, farmer-owners are not as prevalent in the Upper Peninsula as elsewhere in the State. Recreational groups own an insignificant amount of land in the southern half of the Lower Peninsula, but in the more northern forest zone, particularly the northern half of the Lower Peninsula, this group owns large areas. When one considers the objective of ownership (discussed later), recreation as a motive for owning forest land is even greater than the data on occupation tend to indicate, since many of the nonrecreation ownerships are owned mainly for outdoor recreation purposes.

Length of Tenure and Planning Horizons

Because of the long time required for timber products to mature, planning horizons of the individual owner and the stability of ownership are critical. An owner's plans and expectations for managing his forest land are influenced by how long he will hold his property. Indications are that the planning horizons for most owners were quite short (relative to the length of timber production periods) when they purchased or otherwise assumed control of forest land. Two-thirds of the area has been held by the present owners 20 years or less as shown below:

	Percent of woodland area held by present owners for—		
	1-10 yrs.	*11-20 yrs.*	*21+ yrs.*
Upper Peninsula	29	42	29
Lower Peninsula:			
North half	38	21	41
South half	37	39	24
Entire State	36	30	34

TABLE 4. — *Distribution of number of woodland owners and their forest acreage by occupation*
(In percent)

Occupation	Upper Peninsula		North half Lower Peninsula		South half Lower Peninsula		Entire State	
	Owners	Forest area	Owners	Forest area	Owners	Forest area	Owners	Forest area
Farmer	17	13	39	21	20	24	22	19
Part-time farmer	-	-	12	9	11	11	10	7
Forest industry	3	6	*	2	*	*	1	3
Nonforest industry	1	8	*	[1]5	*	1	*	5
Business-professional	10	22	5	15	13	20	12	18
Wage-earner	19	9	32	11	16	15	18	12
Housewife (widow)	13	14	6	8	5	7	6	10
Recreation group	6	6	1	13	*	1	1	7
Undivided estate	2	1	*	3	2	4	2	3
Retired	10	10	3	4	13	14	11	8
Other	19	11	2	10	[2]20	[3]3	17	8

* *Less than 0.5 percent.*

[1] *Approximately 63 percent of this area is in one ownership.*

[2] *Primarily owners of less than 3 acres but more than 1 acre of forest land.*

Since the average owner is 54 years old, the above data suggest that he acquired his forest land at about 40 to 45 years of age.

Assuming that the average owner will relinquish his property at age 65, the most distant planning horizon for the average new owner is 25 years. If he possessed only poorly stocked or nonstocked land, forest investment opportunities would probably have little appeal. Unless he were planning to produce Christmas trees, he would probably not plant trees to satisfy income needs because he would be unlikely to maintain control long enough to harvest a timber crop. One might argue that planting trees would enhance the value of an owner's property. It is doubtful, however, that individuals planting trees would be able to recoup much of their investment should they sell their forest land before the growing stock reached merchantable size.

For the owner whose woodlot has sufficient growing stock to support periodic harvests, expectations and plans can be formulated with a greater degree of certainty. Timber stand improvement work, for example, would bring financial returns in a short period.

Family Ties in Ownership

Three-fifths of all woodland owners in Michigan acquired their property from someone outside of their immediate family (table 5). However, the purchase of forest land from relatives varied considerably by district; in the southern half of the Lower Peninsula it accounted for one-third of the forest land compared with only 4 percent in the Upper Peninsula. For one reason, many of the small ownerships, in the Upper Peninsula particularly, were part of larger lumber company holdings being liquidated. Such exchanges never occurred in the southern half of the Lower Peninsula except in the northern tier of counties. In the northern half of the Lower Peninsula most of the lumber company holdings had been liquidated one or two generations prior to the time most of the present owners took possession of their property.

If shifts in property ownership did not reverse established precedents for promoting timber growth, the relatively rapid turnover of forest land would not be much of a hindrance to forestry. But since the transfer of forest property is generally a non-family exchange, chances are lessened that the new owner's plans would coincide with those of the previous owner.

TABLE 5. — *Means by which owners acquired forest land*

(In percent of forest area)

Method of acquisition	Upper Peninsula	Lower Peninsula North half	Lower Peninsula South half	Entire State
Purchase:				
From relatives	4	14	33	16
From nonrelatives	72	59	57	62
Inheritance	20	27	10	21
Other[1]	4	*	0	1

* *Less than 0.5 percent.*

[1] *Includes tax sale, foreclosure, debt settlement, and gift.*

Owner's Place of Residence

The bulk of Michigan's small forest ownerships is held by people who don't live on them. Only 38 percent of the forest area is owned by people living at the site. Owners residing more than 100 miles away account for 25 percent of the area. However, if just the southern half of the Lower Peninsula is considered the absentee owner is in the minority, although a strong minority, possessing 41 percent of the private forest area. Furthermore, in this area only an insignificant acreage (5 percent) is owned by individuals living more than 100 miles from their woodland.

A generation ago there were probably fewer absentee owners. But today many owners were born and raised on their forest property and have since moved to the larger cities of the Midwest. Such owners often retain their parents' "homestead" for sentimental reasons (fig. 4).

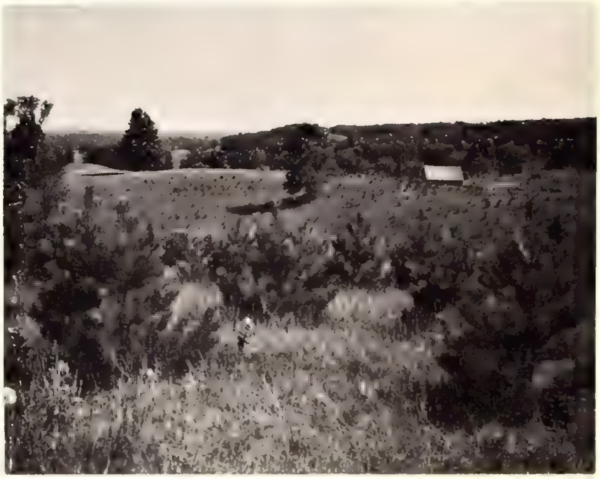


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FIGURE 4. — Idle farm land in northern Michigan planted to pine. Present owner was raised here but now lives in Detroit.

This increasing number of absentee owners has important implications to public administrators. Promotion of forestry assistance programs among absentee owners will probably require a different approach from that used for resident owners.

Timber Products Marketing Activity

There is little evidence of formal planning by owners of small forest properties in Michigan. Only a very few have forest management plans prepared by Cooperative Forest Management (CFM) service foresters, industrial foresters, or consultants. Despite this lack of formalized management, from a physical standpoint, these owners account for the largest segment of the State's timber producing potential. How they harvest and market timber products has an important bearing on the productivity of Michigan's forest lands.

Frequency of Timber Sales

The relatively short span of years that most woodland owners hold their property has already been emphasized. Of course, accompanying and often directly associated with the shifts in ownership are the changes in the forest resource itself. Some owners liquidate their growing stock prior to selling property. Therefore, many new owners acquire nonstocked or poorly stocked land and will never see the day when their forest supports enough merchantable growing stock to attract timber buyers.

Actually, only a small proportion — 3 to 4 percent — of the owners do any timber marketing during a given year. Furthermore, less than half of the owners interviewed had ever sold timber products at all. There are various reasons for this. The most common is that the owner does not have any merchantable growing stock.

Owner's reason for not selling timber products	*Percent of forest owners*	
	Upper Peninsula	*South half Lower Peninsula*[1]
Had no salable timber	60	52
Had not received any offer for timber	4	17
Had not received any suitable offer for timber	(2)	15
Would be incompatible with other uses or values	7	8
Returns from sale would be negligible — not worth time or effort	2	3
No special reason	16	0
Other	11	5

[1] *No data available for northern half of Lower Peninsula.*

[2] *Not listed separately on questionnaire.*

Absentee ownership apparently influences the marketing of timber products. Of the owners who lived in the Upper Peninsula 53 percent had harvested timber products compared with only 11 percent of the absentee owners. Furthermore, the tabulation above shows that 17 percent of the owners in the southern Michigan area who had not sold timber products had never received offers for timber; most of these were absentee owners.

A minority of the owners indicated that logging would be incompatible with other uses or values (usually aesthetic). With the popularity of outdoor recreation intensifying, the number of "vacation owners" of forest land is bound to increase. Conceivably this could lessen the future supply of timber since it is usually this type of owner who finds logging incompatible with other uses.

In the Upper Peninsula and the northern half of the Lower Peninsula forest land often provides seasonal work for the woodland owner. In fact, some of the owners in these two areas are full-time timber producers or loggers. As a result, most of the harvesting activity in these areas was either for home use or sale of cut products; stumpage sales accounted for only a small portion of the timber harvesting activity.

Unlike the situation in the northern zone, logging is a forgotten art among the private forest-land owners in the southern half of the Lower Peninsula. Two-thirds of those who harvested timber sold stumpage rather than did their own logging. What is more, only 9 percent of the owners who did not do their own logging supervised the logging operations.

Cutting Practices

Logging operations provided an opportunity to evaluate the level of forest management being practiced. Judging from the findings in the Lower Peninsula, the management of most small private holdings in this area does not improve the productivity of forest land (table 6). In both of these areas "poor" cutting practices were more prevalent than "good."

Some owners apparently did not realize that the loggers were going to harvest as heavily as they eventually did; however, the high incidence of fair to poor cutting practices generally stems from an owner's desire to liquidate all merchantable

TABLE 6. — *Cutting practices of owners who harvested timber during 5-year period prior to interview*[1]

Cutting practices[2]	Percent of owners harvesting timber		Percent of forest land owned by owners harvesting timber	
	N½ Lower Peninsula	S½ Lower Peninsula	N½ Lower Peninsula	S½ Lower Peninsula
Good	15	18	23	29
Fair	25	41	31	38
Poor	60	41	46	33

[1] *No data available for Upper Peninsula.*

[2] *"Good" cutting means that as a result of the logging activity a woodland will improve in quality and volume productivity within the first 10 years after harvest. "Fair" means that the stand will only maintain its precutting productivity during the 10 years subsequent to harvesting, while "poor" cutting means that the stand's productivity was reduced by logging.*

growing stock. For example, in the northern half of the Lower Peninsula 71 percent of the owners who had harvested timber intended that everything merchantable be harvested. In the southern half, 34 percent of the owners selling timber showed these intentions.

Timber Sale Administration

Most woodland owners who sold timber products did so in a rather unbusinesslike manner. Few realized that to harvest all merchantable growing stock often resulted in the removal of many trees at a stage where annual value growth was very high. Even if they had known this, many undoubtedly would have harvested it all anyway. As we shall see later, many owners were indifferent to forest management programs after having them explained.

Some owners did restrict cutting to certain diameter classes. In the northern half of the Lower Peninsula, for example, owners of about a quarter of the land cutover specified a limitation, while 14 percent marked trees for cutting. In the southern half of the Lower Peninsula, about 20 percent of the owners harvesting timber marked trees for cutting while 40 percent specified either a species or a diameter limit. In the latter instances (species or diameter limit), cutting practices were seldom improved because the cutting limit coincided with the merchantable limits. Only the act of marking trees for cutting led to improved stand conditions.

Owner's Knowledge of Markets and Prices

In the northern forest zones market and price information can be readily obtained. Often an inquiry at the nearest general store or filling station is all the effort it takes to learn the local market situation for wood products or stumpage. Many of the owners in these areas are part- or full-time timber operators with a good knowledge of markets and prices. Furthermore, much of the wood harvested in the northern area is pulpwood, a highly standardized product with a fairly stable price structure (fig. 5). As a result, most (89 percent in the Upper Peninsula) of the sellers of either cut timber products or stumpage in the northern areas generally feel that sources for market and price information are quite adequate. However, this does not rule out the need for better means to disseminate this type of data. Many of the nonsellers, particularly the absentee owners, might welcome such information.

In the farm woodlot area of the southern half of the Lower Peninsula nearly all of the timber harvested is saw logs. Unlike pulpwood, saw logs represent a very heterogeneous, nonstandardized product. Timber marketing in southern Michigan can be likened to horse trading in the sense that each transaction is unique, and the negotiated per-unit price depends largely on the buyer's and seller's relative knowledge of timber prices. Unfortunately, most owners in the southern areas have little knowledge of, let alone contact with, the market for timber products.

One indication of the seller's bargaining position in southern Michigan is the fact that 55 percent of the owners who sold timber had no real basis for judging the reasonableness of the prices received. Another 8 percent of the owners had professional advice, while the rest obtained price information from a friend or else compared different buyer quotations (usually only two). A significant proportion of the owners interviewed (47 percent) expressed interest in a public timber price and market information service.

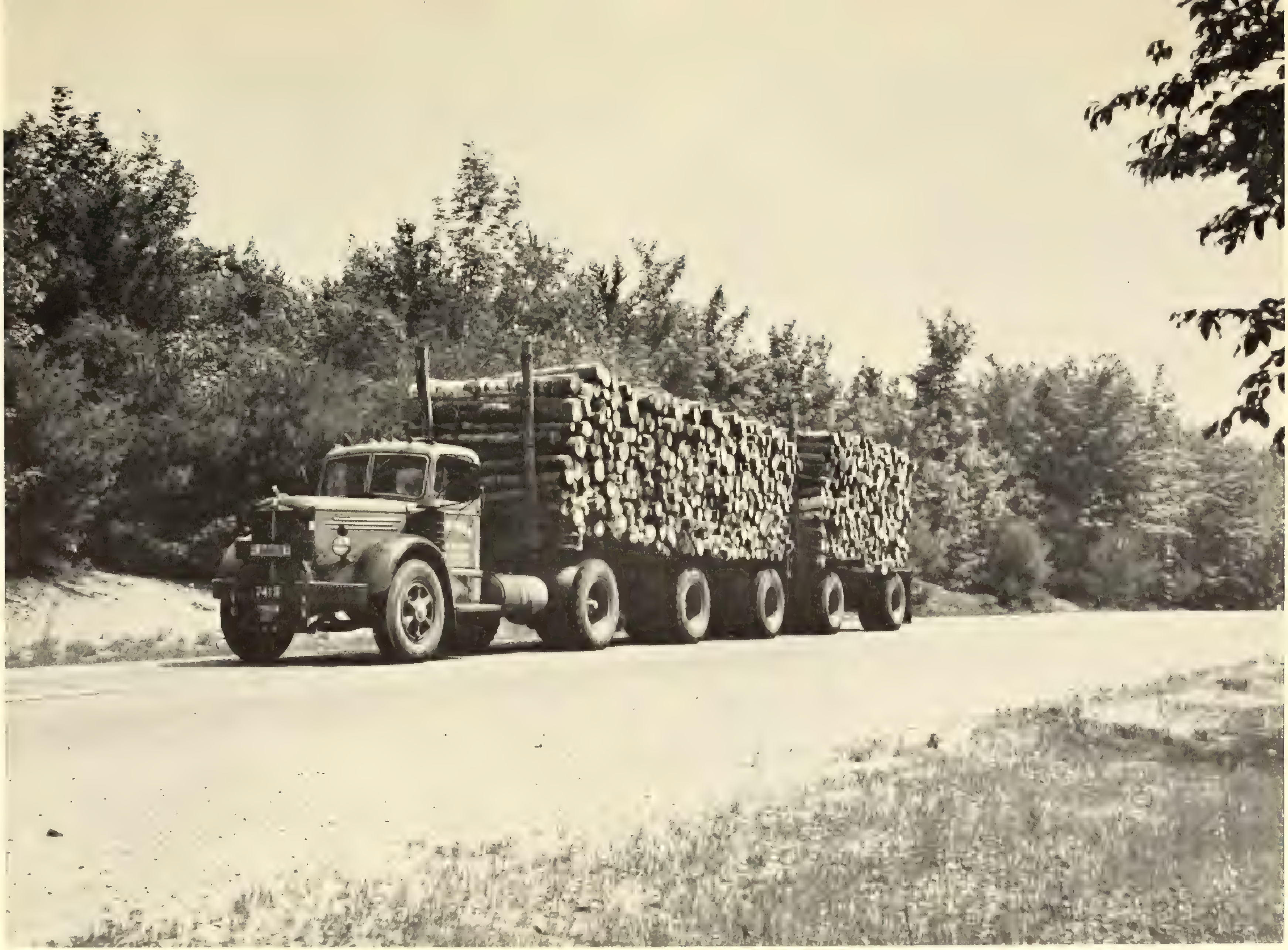

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FIGURE 5. — Pulpwood being trucked to a paper mill — a common sight in northern Michigan.

Woodland Improvement and Tree Planting Efforts

So far the discussion of Michigan's woodland owners as timber producers has concerned only the acts of harvesting and marketing. Technically speaking, these acts merely represent the culmination of the long-term process of timber production. With most crops there would be no harvest unless input factors were introduced at various stages in the production process before harvesting, but in forests a crop of some sort can be brought to maturity without positive effort. Actually, there is little reason to doubt that most of the timber products from the State's small private forests are produced with little or no husbandry on the part of the owner. In both the Upper Peninsula and the southern half of the Lower Peninsula only 5 or 6 percent of the respondents indicated that they had conducted woodland improvement practices.

When one considers that some of this timber stand improvement dates back as far as 20 years, and that much of it was carried out on just a portion of the owner's property, the insignificance of such effort becomes apparent. Obviously not enough has been done to offset the detrimental effect of poor cutting practices, which have downgraded species composition and age-class distribution.

Tree planting is much more popular among the woodland owners than timber stand improvement. In the southern half of the Lower Peninsula 20 percent of the owners had planted trees, while in the Upper Peninsula about 7 percent of the owners had done so. Data are not available for the northern half of the Lower Peninsula, but planting here is more widespread than in the other regions. Stone and Chase (1962) estimated that between 1900 and 1956 private owners planted nearly 168,000 acres of trees in this area.

In the Upper Peninsula the acreage of plantable sites is small. In any case, many of the present owners had worked hard to clear forest land for farming; whether or not this land has since been idled, most of these owners aren't about to turn around and plant trees on it.

Average size of forest plantations established by woodland owners in both the Upper Peninsula and southern Michigan areas was between 6 or 7 acres. When one considers the limited acreages involved and the fact that many of the owners did not plant their trees for timber production purposes, it becomes apparent that tree planting by woodland owners, like timber stand improvement, has not contributed much to the productivity of the forests in these two subregions of the State. In the northern half of the Lower Peninsula tree planting by the small private owner has probably made a more significant contribution.

Owner's Recognition of the Need for Improved Forest Management

The prevalence of poor cutting practices and the lack of interest in timber stand improvement and tree planting reflect the owners' lack of concern for the productivity of their forest land. Simply stated, many of them do not believe that any improvement is needed on their forest land. This lack of concern is most apparent in the northern forest zone of Michigan where more than half of the respondents indicated that no improvement was needed (table 7). But in the southern half of the Lower Peninsula about two-thirds of the owners believed that woodland management should be improved.

This indifference of so many owners toward management for timber production is a manifestation of many complex, interrelated factors. Infrequent and often trifling incomes from the forest, the long-term process of timber production, limited planning horizons, more lucrative alternative uses for time and money, limited concepts of forest management — all these and other factors contribute to apathy toward forestry. It might be asked then, "If the owners are not interested in timber production, why are they holding forest land?" There are many answers.

Only 3 percent of the State's small forest-land owners are making a conscious effort to grow timber for sale or use (table 8). Most of these owners have had professional guidance from a forester (mostly CFM foresters), and all are managing their timberland on a sustained yield basis. But some other owners are maintaining their forest property primarily on account of timber values. Twenty percent gave "farm and/or home use" as the reason for owning their forest land, while another 4 percent keep it because of plans to liquidate mature growing stock when they have enough to attract buyers. However, only those

TABLE 7. — *Owner's recognition of the need for improved forest management*
(Percent of owners)

Owner's response	Upper Peninsula	Lower Peninsula		State
		North half	South half	
Does not believe any improvement needed	52	56	24	35
Believes woodland management needs to be improved	48	43	76	65
No opinion	0	1	0	*

* *Less than 0.5 percent.*

TABLE 8. — *Percentage of owners with various objectives of ownership of forest land*

Objective of ownership	Upper Peninsula	Lower Peninsula		State
		North half	South half	
Farm and/or home use	17	[1] 37	17	20
Pasture	2	([2])	11	8
Fuelwood	2	([2])	6	4
Growing timber for sale or use	0	4	4	3
Liquidation of mature growing stock	4	*	23	16
Investment or speculation	6	4	3	4
Clear for agriculture	0	6	5	4
Recreation	26	39	4	18
Residence	19		2	
Inactive	14	9	19	17
Other	10	1	6	6

* *Less than 0.5 percent.*
[1] *Includes "pasture" and "fuelwood" objectives.*
[2] *Included with "farm and/or home use" objective.*

owners who are "growing timber for sale or use" are managing their timberland on a sustained-yield basis.

For the majority of the owners, benefits from timber production — sustained or otherwise — are not the reason for holding forest land. Eighteen percent keep it for a residential or recreation site, and some of these people would find timber production incompatible with their main objective (fig. 6).

Because of the psychic values associated with landownership, forest land has become a consumption as well as a production good. This situation is more pronounced in the northern counties than in southern Michigan (table 8). As previously pointed out, to the extent that the number of "recreation"

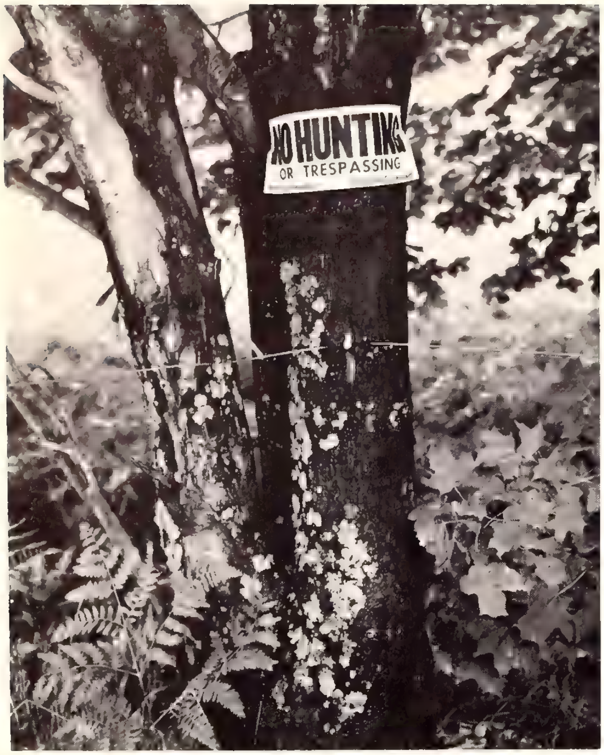

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FIGURE 6. — This sign and single strand of wire mark the boundary of a hunting club in northern Michigan. The single wire legally is a fence and anyone caught trespassing may be prosecuted. An increasing area of forest land is owned by individuals and groups interested primarily in reserving hunting rights.

and "residential" owners of forest land does increase — and with leisure time and better transportation facilities becoming more abundant, it would seem logical to expect such increases — timber production might well become incompatible with the objectives of a larger segment of the small-owner population. Certainly it is a vital issue to consider when projecting future timber supplies.

In the southern half of the Lower Peninsula, urban encroachment of forest land will continue to hamper the flow of timber products. During the first decade after World War II, the annual rate at which forest land shifted to nonforest uses in this area was estimated to be about 1.4 percent. That building boom is over, but cities are still expanding. One interesting aspect of expansion is that individuals living in the "urban fringe" (usually the first tier of townships surrounding a city's corporate limits) are less likely to harvest timber than owners elsewhere; this suggests that forest land ceases to be a potential source of timber before physical encroachment by urban uses. So, like the "recreation-residential" owner, the woodland owners residing in the urban fringe tend to reduce the economic supply of timber products from Michigan's forests.

Interest and Participation In Forest Assistance Programs

During the last three or four decades, particularly during the 1930's, several public-sponsored forestry assistance programs have been inaugurated. Although the approaches may differ somewhat between programs, the basic underlying premise for all of them is that a level of forest conservation deemed optimum from society's standpoint will not be implemented by the majority of woodland owners without outside assistance — technical, monetary, or both.

Assistance Programs Take Varied Forms

The oldest assistance program is forestry extension, which was authorized by the Clarke-McNary Act of 1924. This Act provides for educational assistance to owners of farms in establishing, renewing, protecting, and managing woodlots, shelterbelts, and windbreaks, and in harvesting, utilizing, and marketing the products from woodland areas.

No other assistance program attempts to reach as many people as forestry extension. As with other phases of the cooperative extension program, the County Agricultural Extension Director's office is the point from which much of the forestry extension information and aid is disseminated. With cooperation of the Federal Extension Service and the technical guidance of two extension foresters — one at East Lansing serving the Lower Peninsula and the other at Marquette serving the Upper Peninsula — Michigan's County Agricultural Extension Directors prepare and use newspaper articles, radio talks, circular letters, or other means to stimulate forest conservation. Forestry field days are planned in areas where owners indicate an interest.

On-the-ground public assistance to individual owners is handled by the Cooperative Forest Management (CFM) foresters. The Cooperative Forest Management Act of 1950 authorized the Federal government to cooperate with the States in providing technical service to private forest-land owners and operators and to processors of primary forest products. This Act superseded the Norris-Doxey Act of 1937, which was similar but restricted assistance to farmers only.

Department of Conservation district foresters are responsible for providing CFM assistance statewide. However the amount of time spent on this activity varies considerably from area to area. Because of the relatively light demand for CFM aid, district foresters in the Upper Peninsula devote only about 5 to 6 percent of their time assisting private landowners. The bulk of their time is spent managing public lands. In the northern half of the Lower Peninsula, about 25 percent of the technical time is devoted to CFM work, and in southern Michigan 90 percent. Since the manpower assigned to the two northern districts is about three times that of the southern zone, the disparity in time devoted to CFM activities is not as great as the precentages imply. The following tabulation shows how much Conservation Department manpower was devoted to the CFM program during the 1961-62 Fiscal Year:

	Man-years
Upper Peninsula	1.5
Lower Peninsula	
Northern half	6.0
Southern half	7.2
Total	14.7

Although Federal financing of CFM activities for the Upper Peninsula was not utilized until 1957, Department of Conservation foresters provided this service at State expense prior to that time.

Forestry plays an important role in the Soil Conservation District Program. The Soil Conservation Districts (SCD), which are governmental subdivisions of the State operated and controlled by land occupiers, provide a means by which farmers and other landowners can organize to protect their soil and water resources. The Soil Conservation Service provides technical assistance. Where appropriate, forestry measures are included in the farm plan. For example, such a plan may call for a reduction or increase in woodland area. Under a written Memorandum of Understanding with the Soil Conservation Service, the Forestry Division of the Michigan Department of Conservation, when needed, provides technical assistance to Soil Conservation District cooperators.

All but 10 of Michigan's 83 counties are organized into Soil Conservation Districts. Soil Conservation Service technicians are available to assist landowners outside of the district boundaries.

In addition to the informational services of the forestry extension program and the on-the-ground technical assistance provided by the Soil Conservation District and the CFM Program, Michigan's small forest-land owners can get financial aid for carrying out certain conservation practices through the auspices of the Agricultural Conservation Program (ACP). Tree planting has been the most popular forestry practice promoted by ACP, but various timber stand improvement practices are gaining rapidly both in recognition by Agricultural Stabilization and Conservation Service (ASCS) personnel and in acceptance by the landowner. An owner applying for cost-share payments must have the proposed practice certified by a Conservation Department District forester before payment is authorized. Generally, the owner is reimbursed for about half the cost.

Response to Assistance Programs Varies

Generally speaking, participation in forestry assistance programs has been minimal. However, participation and interest vary somewhat depending upon the program and the area of the State.

Most of the owners in the southern half of the Lower Peninsula were familiar with farm-practice aspects of the ACP. Many had received cost-share payments for carrying out nonforestry conservation practices, but few knew of or had participated in the forestry phase. Owners of only 6 percent of the area's small private forest land had received forestry cost-share. However, another 10 percent of the owners previously not familiar with forestry ACP indicated some interest in such assistance after it was explained to them. With additional exposure to the program many of these owners would probably apply for ACP cost-share to improve their woodland management. Owners of most of the forest land (84 percent) said they would not be interested.

Even fewer woodland owners of southern Michigan had participated in the forestry extension program than in the ACP program. Owners who had had extension aid accounted for only 1 percent of the forest land, but owners of 19 percent of the forest area showed some degree of interest after the extension program was explained to them.

One out of 10 woodland owners in southern Michigan had a Soil Conservation District farm plan, but only a minority of these "planners" had adopted forestry practices. Twenty-five percent of all planners did "retire" some cropland or grassland by planting trees.

Judging from the response to questioning, the CFM Service Forestry Program has the most appeal to woodland owners in southern Michigan. Owners who had received CFM aid accounted for 8 percent of the area's privately owned forest land, while another 8 percent of the forest area was owned by individuals who knew of and expected to ask for CFM aid in the future. In addition to these two groups, "interested" owners accounted for 28 percent of the forest area. These present and potential CFM clients own 57 percent of the value of the merchantable growing stock in southern Michigan.

Since most of the owners who sought CFM forestry aid did so when they were trying to sell stumpage, it was possible to obtain some indication of the effectiveness of the CFM Program. A comparison of cutting practices showed that almost 60 percent of the owners receiving CFM aid practiced good cutting versus only 13 percent of the nonparticipants.

In the northern half of the Lower Peninsula aid from both ACP and forestry extension was greater than from CFM. Owners of 11 percent of the small private forest land in the northern half of the Lower Peninsula had received ACP forestry cost-share while owners of another 8 percent of the forest area exhibited some degree of interest. Recipients of forestry extension assistance accounted for 16 percent of the area's forest land, and another 27 percent of the woodland was owned by persons interested in such aid.

Owners who had received CFM aid accounted for a smaller share of the land in small ownerships (9 percent) than owners participating in ACP or extension programs. But once the opportunities of the various programs were explained, CFM had the most appeal to the "uninitiated" interviewees. This interested group accounted for 61 percent of the area's small private forest land. Because additional exposure to this program would probably stimulate more actual participation, and because promotion of the CFM Service Program has been stepped-up considerably in the northern half of the Lower Peninsula since this information was gathered, a reassessment would undoubtedly disclose more participation.

The prevalence of SCD cooperators was about the same in the northern half of the Lower Peninsula as in the southern half. Owners of approximately 10 percent of the small private forest land in the northern half had farm plans. As in southern Michigan, few cooperators had adopted forestry practices as a result of the SCD plan. Of those who did, most stated that they had planted trees.

While a significant number of Upper Peninsula woodland owners were familiar with the availability of technical on-the-ground assistance — 21 percent of them knew that advice could be had while an additional 18 percent could cite a specific source — only 12 percent received such aid. The bulk of assistance in such instances came from State foresters (3 percent of owners) and Soil Conservation Service personnel (also 3 percent). County agents and the extension forester also helped 3 percent of the owners. Most of the advice concerned tree planting, but about a fourth of the owners asked for aid in timber harvestng.

Only about 3 percent of the Upper Peninsula owners had applied for forestry ACP cost-share payments, and even fewer were interested after it was explained to them. Almost all of those receiving ACP assistance did so in connection with tree planting operations.

Other Forestry Programs Are Available

In addition to public assistance programs a number of private agencies are at work. One is the American Forest Products Industries (AFPI) Tree Farm Program. Designation as a "Tree Farmer" serves as public recognition of an owner's voluntary commitment to practice good forestry (fig. 7). There are no membership dues, no subsidies or assessments. Much of the emphasis has been directed toward owners of more than 5,000 acres. As of August 1962, 885 woodland owners had been designated as Tree Farmers in Michigan. They owned 138,150 acres of forest land.[4] Many small owners are aware of the program, but few knew the qualifications. Most of the owners who had participated felt that their attitude toward forest conservation was enhanced by the association with the Tree Farm Program.

Some AFPI-member companies have established their own programs under which they will provide technical service to woodland owners under contract for purchase of timber products.

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[4] *Letter from James C. McClellan, Chief Forester for American Forest Products Industries.*

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FIGURE 7. — Nearly 900 Michigan woodland owners have been designated Tree Farmers.

Private consulting foresters have aided some of Michigan's woodland owners. Five forestry consulting firms are headquartered in Michigan, two of which restrict their activities to the Upper Peninsula. Judging from the limited interest shown by landowners, the potential for expanding customer service to small woodland owners is quite limited. Less than 1 percent of the owners in the southern half of the Lower Peninsula expressed interest in hiring a consulting forester to help manage their forest property. In the Upper Peninsula a somewhat larger proportion, 6 percent, was interested.

Owners were also queried as to their interest in cooperative agreements whereby they would join with other woodland owners in hiring a forester to manage their forest properties. This idea had very little appeal to owners in the Lower Peninsula. In the southern half only 5 percent and in the northern half 1 percent of the owners expressed an interest. On the other hand, a fairly large number of owners in the Upper Peninsula were attracted by the suggestion — 14 percent of the owners with 32 percent of the land. This difference is partly accounted for by differences in ethnical backgrounds. A higher proportion of persons of Finnish background live in the Upper Peninsula, and cooperatives have long been a part of the national way of life in Finland.

Influence of Credit and Taxation On Forest Management

It has often been suggested that if low-cost credit were available more woodland owners could be encouraged to practice forestry. Of the owners questioned on this subject, 12 percent in southern Michigan, 7 percent in the northern half of the Lower Peninsula, and even fewer in the Upper Peninsula were interested in forest credit. If profitable forestry investment were shown to exist, perhaps more owners would be interested.

The idea of forest credit sounds good. It could serve as a means of reducing the pressure on forest owners to liquidate their timber capital when they needed ready cash — for example, when one heir is trying to buy out the interests of others. But since most woodland owners are indifferent toward forest credit, lending institutions would have a task trying to stimulate a demand for loans secured by forest real estate.

Action has been taken in the past to reduce the financial strain brought about by another institution — the *ad valorem* property tax. Michigan has two forest yield tax laws: The Woodlot Yield Tax Law and the Commercial Forest Reserve Act, both designed to shift the incidence of tax on forest property from periods when no income is being derived to occasions when harvest cuts are made. Hence, the name "yield tax."

About 475,000 acres of Michigan's forest land has been registered under the Commercial Forest Reserve Act. However, all but about 18,000 acres of it is in holdings of more than 5,000 acres. Less than 60 woodland owners have listed forest tracts under this Act.

No centralized records are maintained on the Woodlot Yield Tax, so it was not determined how much use has been made of it. It is generally believed that the few properties that have been listed are nearly all located in southern Michigan.

Only about 50 percent of the area classified as small ownerships qualifies for registration under either of the yield tax laws.[5] As shown below, the percent of holdings that qualify is quite uniform throughout the State.

	Percent of forest area
Upper Peninsula	46
Lower Peninsula:	
Northern half	58
Southern half	45
Average for State	51

When questioned, less than 10 percent of the owners in the Upper Peninsula and the southern half of the Lower Peninsula were familiar with either law. Owners of 72 percent of the forest land in the northern portion of the Lower Peninsula said they were unfamiliar with the tax laws.

None of the interviewees in the Upper Peninsula or southern Michigan area had registered their forest land under the Woodlot Yield Tax Law or the Commercial Forest Reserve Act, and only 1 percent of the owners had done so in the northern half of the Lower Peninsula. Therefore, it was not possible to appraise the effect these laws had on forest management. All owners who had registered forest land under these laws, however, indicated that the action did not affect their forest management activity.

Owners who were familiar and qualified, but had not registered land, gave a variety of reasons. Some felt that if they did, assessments would be raised on other property to make up for the loss of tax.

Despite the fact that few owners had taken advantage of forest yield tax laws and only a small percent were interested after it was explained to them, the laws have some effect. They serve to moderate assessments where an increase might prompt owners to use them.

Woodland Owners a Heterogeneous Lot

It is well understood that the woodland owners are a very heterogeneous grouping of individuals. Often, however, too easy generalizations are made for the entire group. True, most of the owners are indifferent toward forestry practices, most own their forest land for reasons other than timber production, and most have not participated in assistance programs. Nevertheless, certain distinctions should be recognized, particularly if the goal is to achieve more participation in forestry assistance programs.

We often hear reference to "farm woodlot" owners, when in reality the farmer group accounts for only a minority of the small holdings. But even here the situation varies from one section of the State to another. The farmer category owns proportionately more forest land in the Lower Peninsula (approximately one-third of the area) than in the Upper Peninsula (13 percent of the forest area). Failure to recognize these occupational differences has probably dampened the effectiveness of assistance programs in the past, since most information is channeled to the farmer group.

Absentee ownership, which also exhibits considerable variability in Michigan, is another factor in reaching the woodland owners with assistance programs. In the past, publicity has been mainly directed toward the resident owner. In southern Michigan, where absenteeism is not very prevalent, the consequences may be slight, but for the remainder of the State increased efforts to reach the absentee owner would seem justified.

Interviewees cited many reasons for owning forest land, and again this varied throughout the State. Although few gave timber production as their reason, some of the nontimber production motives might be more compatible with increased forest product output than others. In other words, steps to encourage increased timber production among the nontimber producers should probably take various forms depending upon characteristics such as the owner's objective of ownership and alternative uses for time and money. Lastly, of course, there is the matter of size. The term "small ownerships" covers a wide range of sizes from very small holdings of a few acres up to 5,000 acres. In the past forestry assistance has been administered indiscriminately of size of an applicant's forest holdings. It would seem that there is merit in directing more time and effort toward the larger small ownerships.

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[5] *To qualify for the Woodlot Yield Tax a wooded tract must not be more than one-fourth of a parcel of land 160 acres or less in size, of which at least 50 percent is improved and devoted to agriculture. If stocking specifications are not naturally met the tract must be planted. Also, woodland grazing is not allowed. To qualify for the Commercial Forest Reserve Act no portion of a wooded property may be devoted to agriculture, grazing, industrial, recreational, or resort purposes. The land must be classified as commercial forest land but cannot be overstocked with mature timber at the time of application. The stocking must meet certain specifications, and no restriction on public hunting or fishing on the property is allowed.*

LARGE PRIVATE FOREST-LAND OWNERSHIPS

Approximately 3 million acres of private commercial forest land in Michigan are in ownerships of 5,000 acres or more. This is more large private forest acreage than in the two other Lake States combined. Most of it is in the Upper Peninsula. Only 11 percent lies south of the Straits of Mackinac.

The 3 million acres are divided among approximately 57 ownerships and average about 55,000 acres in size. These figures contrast sharply with the 180,000 small ownerships with an average of 60 acres apiece. As shown below, better than two-thirds of the large forest ownership is held by 10 owners having 100,000 acres or more each.

Area size-class (Acres)	*Number of owners*	*Percent of forest area*
5,000 — 25,000[1]	31	12
25,001 — 50,000	10	10
50,001 — 100,000	6	13
100,001+	10	65
Total	57	100

[1] *The number of owners in the 5,000-25,000 class is an approximation. There are probably a few more owners with 5,000 - 10,00.. acres of forest land. Such ownerships are difficult to locate from county records and plat books because they are usually made up of many scattered holdings.*

Half of Large Ownership Area Owned by Forest Industry

Individuals owning more than 5,000 acres of forest land are the exception rather than the rule; they account for only 3 percent of the forest area in large ownerships (table 9). The remainder of the large ownerships represent various sorts of corporate agencies. Ownership patterns differ considerably between the Upper and Lower Peninsulas. At the State level forest industries account for 46 percent of the large forest ownership area, but they own only 7 percent of the area in the Lower Peninsula. Recreational groups, which have only a small segment (3 percent) of the Upper Peninsula's large forest ownership area, have 31 percent in the Lower Peninsula and are the second largest single group of owners in terms of forest area. The largest is the nonforest industry group with 48 percent of the area.

The dearth of forest industry holdings in the northern half of the Lower Peninsula resulted from cut-out-and-get-out tendencies of the early loggers. After logging and forest fires had depleted growing stock levels, timber barons were no longer interested in maintaining ownership of their lands. In contrast, logging of old-growth timber in the Upper Peninsula was more gradual and fire history less severe. Also, being more isolated and less desirable for farming, the Upper Peninsula has never experienced much change resulting from agricultural production and the accompanying land clearing and fragmentation.

Large Ownerships Exhibit Stable Tenure

Short tenure probably inhibits the promotion of better forestry on the part of the woodland owner. In contrast the large corporate ownerships display very stable tenure. Approximately 85 percent of the large owners (possessing the same percentage of the forest area in large ownerships) have ownership ties dating back at least 20 years.

TABLE 9. — *Large private forest-land ownerships by type of ownership*
(In percent)

Type of ownership	Upper Peninsula		Lower Peninsula		State	
	Owner	Area	Owner	Area	Owner	Area
Individual	8	2	7	9	8	3
Forest industry	50	51	7	7	39	46
Nonforest industry	17	27	20	48	17	29
Recreation groups	7	3	53	31	19	6
Other	18	17	13	5	17	16

Length of tenure (years)	*Percent of forest owners*	*Percent of forest area*
0-20	14	14
20-40	30	33
40+	56	53

More than half of the owners have had their forest property for at least 40 years. In fact, several of the ownerships date back to the 1890's.

The *number* of large forest-land ownerships has been decreasing in Michigan, but the reasons for this vary between the Upper and Lower Peninsulas. In the Upper Peninsula large ownerships have been consolidated. In the Lower Peninsula there has also been some consolidation, but the trend is toward more fragmentation of large forest ownerships. Since the 1930's several have been divided up and sold to individuals.

Reasons for Owning Forest Land Differ

Owners of large forest areas, like small owners, have various reasons for holding forest land. Unlike the small owner, however, the majority, 51 percent, are interested primarily in timber production (table 10); they own 60 percent of the forest land. Another 6 percent of the owners, accounting for 20 percent of the land, hold forest land for both timber production and recreation.

Again a contrast between Upper Peninsula and Lower Peninsula owners is apparent. The objective of 60 percent of the owners in the latter area is recreation. Most are hunting clubs. In the Upper Peninsula only 7 percent of the owners have a recreation objective. Stated the other way, only a small minority of the Lower Peninsula owners maintain their forest land primarly for timber production, whereas most of the present owners in the Upper Peninsula (65 percent) do.

Management of Forest Land Often Geared To Sustained Timber Production

Prior to World War II, very little forestry was practiced in Michigan on private lands. Only a few of the larger ownerships had industrial forestry staffs. Since the war, however, most of the industrial forest owners and several of the nonforest industries, recreational groups, and "other" owners have formed their own staffs or hired consultants. As shown below, about 84 percent of the large owner area is managed by professional foresters:

Number of foresters	*Large owners (percent)*	*Forest area (percent)*
None	44	16
1	15	6
2-5	27	50
6 or more	7	26
None, but obtains outside professional aid	7	2

Most of the forest land in large ownerships is being managed for timber production. More than half of the owners have management plans that guide timber harvesting on a sustained yield basis. These owners account for 83 percent of the acreage. Most, but not all, are forest industries.

TABLE 10. — *Primary objective or reason for holding large forest ownerships (In percent)*

Objective	Upper Peninsula		Lower Peninsula		State	
	Owners	Area	Owners	Area	Owners	Area
Timber production	65	66	7	7	51	60
Recreation	7	3	60	33	20	5
Timber production and recreation	7	22	-	-	6	20
Speculation	4	1	7	9	5	2
Inactive	2	3	7	3	3	3
Other[1]	15	5	19	48	15	10

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[1] *Includes watershed management, liquidation of growing stock, and mineral deposits.*

Not all of the management plans are elaborate, but some are very detailed. In the past some owners have found it difficult to maintain cutting levels within sustained yield limits, but by and large most owners who have management plans are endeavoring to maintain or increase their present level of timber growth. Nearly all of these owners also make periodic forest inventories. Those who do not have adopted cutting standards which spell out residual basal area limits.

In addition to plans and inventories, about a third of the owners have tree planting programs. Since much of their timberland is fairly well stocked, tree planting activities need not be extensive. About half of the owners who plant trees also conduct timber stand improvement operations.

No appraisal of cutting practices was made in connection with this report on Michigan's larger forest-land ownerships. However, it is possible to get some idea of the quality of logging from the Timber Resources Review. The TRR estimated that the productivity of recently cutover land owned by this group in the Lake States was comparable to that found on public forests (U.S. Forest Serv. 1958, p. 609). Since Michigan accounts for 63 percent of the large ownership area in the Lake States region, these findings are probably fairly representative of the situation in Michigan.

Large Ownerships Registered Under the Pearson Act

As mentioned earlier approximately 475,000 acres of forest land had been registered under the Commercial Forest Reserve Act (Yield Tax Law). Of this total, 96 percent is owned by individuals or corporations having 5,000 acres or more of forest land. The land entered by these owners represents about 15 percent of the large ownership area. Practically all of the entries are in the Upper Peninsula.

PUBLIC FORESTS

Michigan's public forests are lands that nobody wanted. As we shall see, most of the State and National Forest lands were formerly in private ownership but were forfeited by their owners for taxes.

Municipal and county governments own some forest land in Michigan, but the amount is insignificant. For this reason, only State and National Forests will be considered here.

State Forests

Although the State Forest system dates back to 1903, until the 1930's the acreage of forest land involved was less than one-tenth of its present size. As late as 1920 most of the area now in Michigan's State Forest system was still in private ownership. At that time only about a million acres of land was in State or Federal ownership, most of it located in the northern cutover counties (Barlowe 1948, p. 9).

When the Michigan Department of Conservation was organized in 1921, there were only about 275,000 acres of State Forest land. It was at this time, however, that large-scale reversion of tax-delinquent lands began. By 1933 the State Forests had increased to over 800,000 acres. A tax moratorium between 1933 and 1938 stemmed the flow of private land to public ownership, but within a year after the moratorium was terminated 2.2 million acres reverted to the State. County land use planning committees tackled the monumental job of sorting this land to determine its proper use — whether to retain in public ownership or return to private hands. The larger part, 1.8 million acres, was retained and added to State Forests and State game areas.

The last significant addition to the State Forest System occurred in 1946, when 1.4 million acres of State-owned game areas in northern Michigan became State Forests.

Now 23 separate State Forests, ranging from 35,000 to over 300,000 acres each, make up the 3,765,000-acre State Forest System, the largest in the Nation (fig. 8). These lands are administered by the Forestry Division of the Conservation Department. An average of 62 percent of the gross area within the boundaries of the State Forests is State owned (table 11).

Timber Product Output From State Forests Is Increasing

Most of the State Forest area was not capable of supporting timber harvests until about 1941. Prior to that, the volume cut was negligible and consisted mostly of salvage material from windstorms and fires. Since the beginning of World

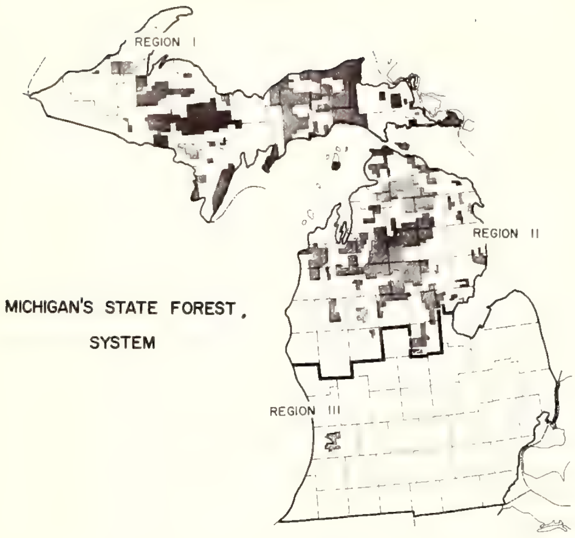

FIGURE 8. — Location of Michigan's State Forests. Of the 23 State Forests, 11 are located in the Upper Peninsula (Region I), 11 in the northern half of the Lower Peninsula (Region II), and 1 in the southern half (Region III).

War II, however, the harvest has increased rapidly (fig. 9). In 1941, for instance, the total volume of cut — all units converted to board feet — was 2.8 million board feet. In comparison, the 1960 cut was nearly 136 million board feet. Annual receipts from timber sales increased from $6,806 to $795,816 during the same period.

TABLE 11. — *Distribution of State forest land by region*

Region	Net State ownership	Gross area within State Forest boundaries	Percent State owned
I (Upper Peninsula)	1,848,593	3,085,377	60
II (North half Lower Peninsula)	1,884,267	2,953,849	64
III (South half Lower Peninsula)	32,558	47,160	69
Total	3,765,418	6,086,386	62

Source: Michigan Conservation Department, Twentieth Biennial Report, 1959-1960.

The increased sale of timber products is attributable mainly to more pulpwood cutting. Saw log cutting, which generally accounts for less than 10 percent of the annual volume, has remained fairly stable during the past 10 to 15 years. Pulpwood production, on the other hand, more than tripled between 1951 and 1960.

The State Forests make a significant contribution to the total output of timber products in Michigan. For example in 1957, 21 percent of the State's pulpwood harvest and 36 percent of its chemical and charcoal wood came from State Forests (Kearns et al. 1962, p. 7). However, of the State's saw log and veneer log volume output, only 4 percent and 6 percent, respectively, were accounted for by State Forests, which do not own much timber of saw log size.

Timber Sales Actively Administered

The private woodland owner has been described as a rather passive producer of timber products. From the ensuing two sections (as well as a comparable discussion pertaining to the National Forests), it will be apparent that the public forest managers play a positive role in marketing timber.

During the 10-year period 1951-1960, receipts from timber sales averaged about $550,000 annually. The number of sales varied from 1,500 to about 2,300 per year. Most of them involved payments of $500 or less.

Timber sales are handled differently depending upon the amount of money involved. If the sale involves less than $1,000 it may be made directly by the District Foresters without advertising. Sales involving $1,000 or more are called "public" sales and in addition to being advertised, they require approval by the Conservation Commission. Upon approval, stumpage is sold by auction or sealed bid. During the 1961-1962 biennium "public" sales accounted for only 8 percent of the permits issued on State forest land, but they accounted for 43 percent of the total receipts.

Cutting System Carefully Planned

Determination of the allowable cut for each of the State Forests is based upon continuous forest inventory in which each Forest is reinventoried every 6 or 7 years. At the time of reinventory identical plots are remeasured, and growth and drain are projected for the next 10 years. That

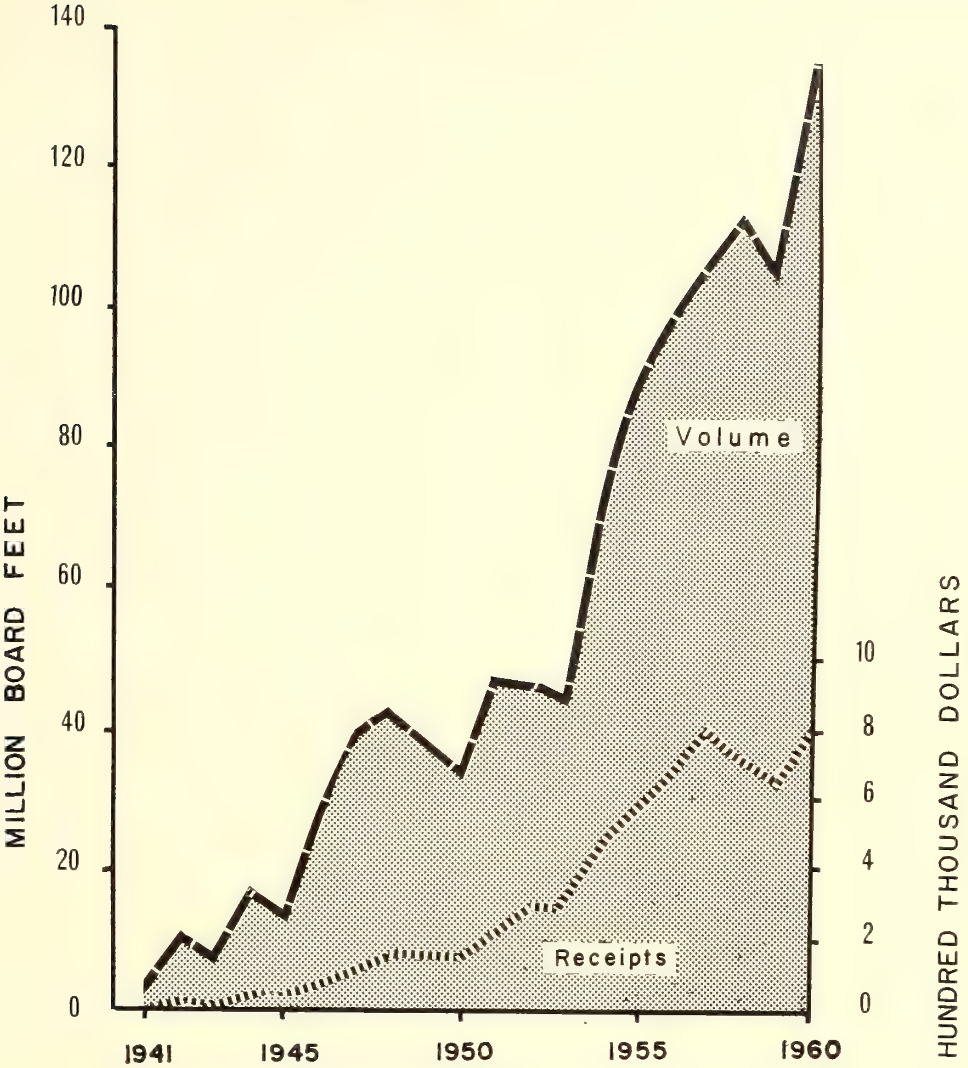

FIGURE 9. — Timber output from Michigan's State Forests, 1941-1960.

is, by rewriting management plans every 6 to 7 years the forest manager can assess progress toward a 10-year goal, at which time new goals are established for an ensuing 10-year period. Table 12 shows that for a 3-year period, 1959-62, the actual cut was somewhat below the allowable cut. For instance, in terms of cordwood material, the area was undercut by about one-third.

The Forestry Division's system for regulating the cut is based on area as well as volume control. Under this system each type within a forest is classified by "cutting period." The cutting period reflects the maturity class of the stand as indicated by age and condition. Five cutting periods are used in this classification scheme:

TABLE 12. — *A comparison of average annual allowable cut to average annual actual cut for State Forest lands of Michigan, July 1959 through June 1962.*[1]

Region	Annual allowable cut		Annual actual cut	
	Cords	Thousand bd. ft.	Cords	Thousand bd. ft.
I (Upper Peninsula)	162,985	10,240	121,578	4,361
II (North half Lower Peninsula)	197,395	5,175	116,229	4,959
State total	360,380	15,415	237,807	9,320

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[1] *Cut from State forest lands in Region III was negligible.*

Period: I.— Mature and should be cut within 5 years.
II.— Mature or near mature but not in danger of serious loss — cutting can be deferred 5 to 10 years.
III.— Will reach maturity within 10 to 20 years.
IV.— Will reach maturity in 20 to 40 years.
V.— Will not reach maturity for at least 40 years.

Figure 10 shows schematically how the cutting period technique was utilized to compare actual area and volume for the jack pine type of the Thunder Bay River State Forest with optimum conditions and under full regulation. It points out, for instance, that a disproportionate area and volume of the type is in Period IV, and that if this is not corrected a greatly increased volume of jack pine may be expected to become available 20 to 40 years later. On the other hand, the area now in Cutting Period V is much smaller than regulation would dictate. Cutting Period III occurs in approximately the desirable quantities both as to area and volume, while Periods I and II combined cover approximately the desirable area but contain somewhat less than the desirable volume. Harvest of some of the Cutting Period IV volume and area within the next 10 years, along with Period I and II material, will thus tend to improve regulation for continuous yield. The sacrifice of volume growth resulting from harvest of immature timber must be considered in relation to the desirability of attaining improved regulation.

At the time of reinventory, the District Forester and Regional Foresters meet with timber management and survey specialists and determine the course of cutting in a particular State Forest, by types, for the next 10 years. However, it is the District Forester's job to delineate the cut by stands.

Reforestation Program Modified in Recent Years

Michigan's State Forest planting program dates back to 1904, but during the next 24 years less than 2,000 acres were planted annually. Planting on State Forest land did not commence in earnest

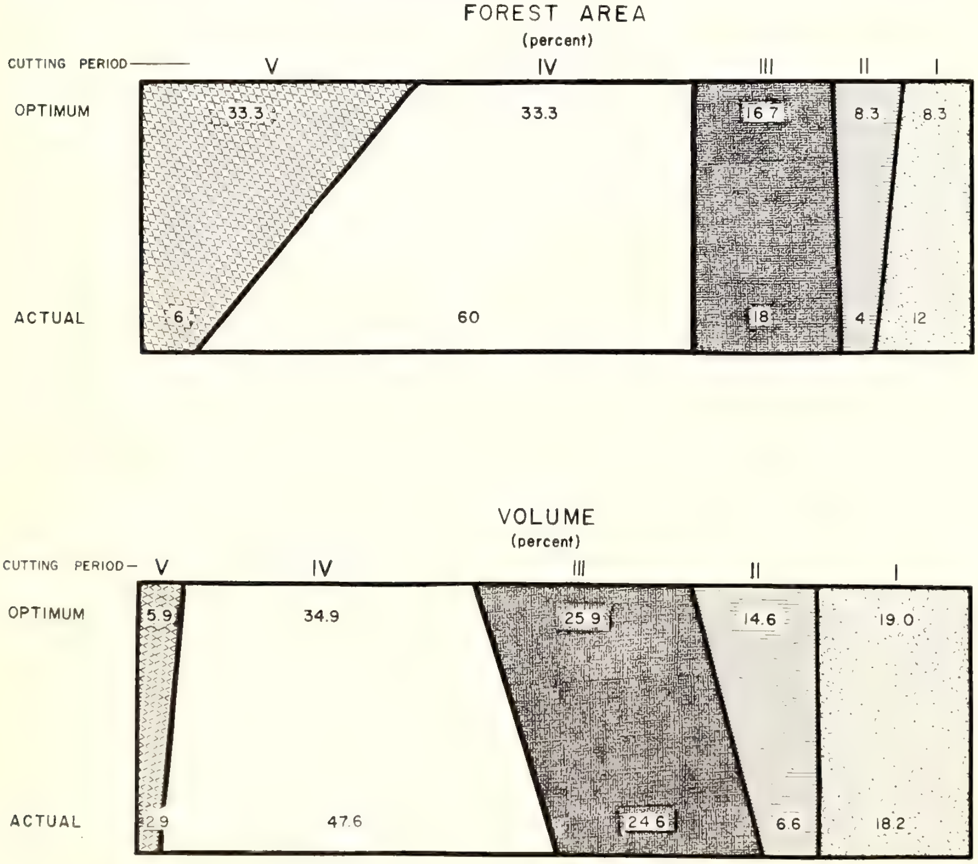

FIGURE 10. — Comparison between optimum and actual area and volume distribution, jack pine type, Thunder Bay River State Forest. Figures do not add to precisely 100 percent because of rounding.

until 1928 when 13,027 acres were established. During the next 14 years 211,954 acres, or 63 percent of the plantation area established to date, were planted. Since 1941, however, only 87,811 acres, or 26 percent of the total, have been established. All told, 341,393 acres of trees were planted between 1904 and 1960, but this includes some areas that were replanted. Actually the net area restocked by planting totaled 295,087 acres.

Planting rates have dropped gradually during the past 10 years. In 1955 the Conservation Commission approved a goal of 20,000 acres per year. At this time it was estimated that 250,000 acres needed to be planted. In 1960 the Commission decided to reduce the annual planting rate from 20,000 to 10,000 acres, and the reforestation goal to 80,000 acres. Since 1955 about 80,000 acres had been planted, and another 90,000 acres removed from the area to be planted by agreement between the Forestry and Game Divisions. Nearly all of the 90,000 acres were in areas being withheld because of game habitat requirements, but some were removed because natural regeneration had taken place. A further reduction of planting to an annual goal of approximately 5,000 acres will become effective in 1964.

Timber Stand Improvement Activity Stepped Up

Prior to 1962 timber stand improvement cutting was done only at the time of commercial harvesting. Funds were not available for cutting in nonoperable stands. As the planting program is reduced, funds from State Forest timber sales will be used for other forest management practices including timber stand improvement. Table 13 shows that about 130,000 acres are in need of timber stand improvement between 1962 and 1972. Not all of the areas scheduled for treatment will yield a commercial harvest within the 10-year period. Many poorly formed and low-quality trees should be removed if growth rates of the desirable growing stock are to be increased.

It is further estimated that an additional 80,000 acres will need treatment in 1972-82. After 1982 relatively little area should need timber stand improvement work aside from that required during normal harvesting periods.

Protection Programs Guard Against Fire, Insects, and Diseases

Until protection against fire was assured, State Forest management was in jeopardy. Currently, the area being burned over annually is well below

TABLE 13. — *State Forest areas in need of timber stand improvement for the period 1962-72.*
(In acres)

Type and region	Stand size and stocking				Total
	Small sawtimber		Poletimber		
	Good	Medium	Good	Medium	
Northern hardwoods					
Region I	2,017	15,826	12,986	35,435	66,264
Region II	-	2,204	19,278	31,615	53,097
Hemlock					
Region I	320	5,521	196	1,202	7,239
Region II	-	-	488	-	488
Pine					
Region I	669	1,473	-	291	2,433
Region II	-	33	82	479	594
Total	3,006	25,057	33,030	69,022	130,115

0.1 percent of the total area protected — a level well below the goal of most forest fire control agencies.

In addition to the fire protection program, the Michigan Conservation Department sponsors a Statewide forest pest detection and control system. This program, which was the first of its kind in the Nation, was organized in 1950. The objectives of the program are, (1) To detect the presence of forest insects and diseases, and to apprehend outbreaks by systematically and annually collecting records of occurrence and damage; (2) to facilitate and organize direct control in case of emergency; and (3) to provide a basis for protective measures by indirect means (Mich. Dept. Conserv. 1961).

The Pest Detection and Control Program is carried out in cooperation with various other public agencies. However, actual fieldwork is conducted by the field personnel of the Forestry Division, which handles State and private lands, and the U.S. Forest Service, which handles National Forest lands. It should be noted that legislative approval has been obtained to use reforestation funds for forest protection purposes, primarily to facilitate insect and disease control.

Multiple-Use Concept Guides Management of State Forests

So far the discussion of the management of Michigan's State Forests has emphasized timber production. But timber production, game management, and recreation are given equal emphasis in deciding how the State Forests are to be managed.

A wide variety of recreational facilities has been developed on State Forest land as a result of the Conservation Department's multiple-use policy. They include campgrounds, public fishing sites, swimming beaches, scenic drives, nature trails, natural areas, game areas, deer yards, and openings managed for wildlife habitat.

Greatly expanded use of the State Forests' recreational facilities is anticipated. To meet the need, the campground system will be enlarged considerably within the next few years (fig. 11). There are now 100 campgrounds. Plans call for 100 more to be developed in the immediate future. There are now 13 foot-trails and 6 scenic forest drives. It is hoped that in the near future each of the 23 State Forests will have several designated foot-trails and at least one scenic drive.

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Figure 11. — Camping in Michigan. Proximity to several large, rapidly expanding metropolitan areas has provided the impetus for enlarging State Forest campground facilities.

To better coordinate the Department's multiple-use policy, the Forestry Division in cooperation with the other divisions is now preparing a composite multiple-use map which incorporates a *primary forest use classification* system. Previously no single document delineated the present and potential uses of all State-owned forest lands.

The primary forest-use classification system recognizes 10 different categories:

1. — *Timber* — game — recreation
2. — *Game* — timber — recreation — deer yards
3. — *Recreation* — game — timber
4. — General game
5. — Natural areas
6. — Special
7. — State Parks
8. — Public fishing sites
9. — Grazing
10. — Minerals

The first three categories are combination uses; one use (that listed first and italicized) is recognized as having first priority, but with management tailored so as not to preclude the development of certain zones within such areas for the secondary uses. The remaining seven categories are single-use areas.

The primary-use classification map is not intended to be a field operating plan. Field maps and plans for each of the individual forests serve this purpose. Rather, this map (fig. 12) is of a general nature designed to show the public that

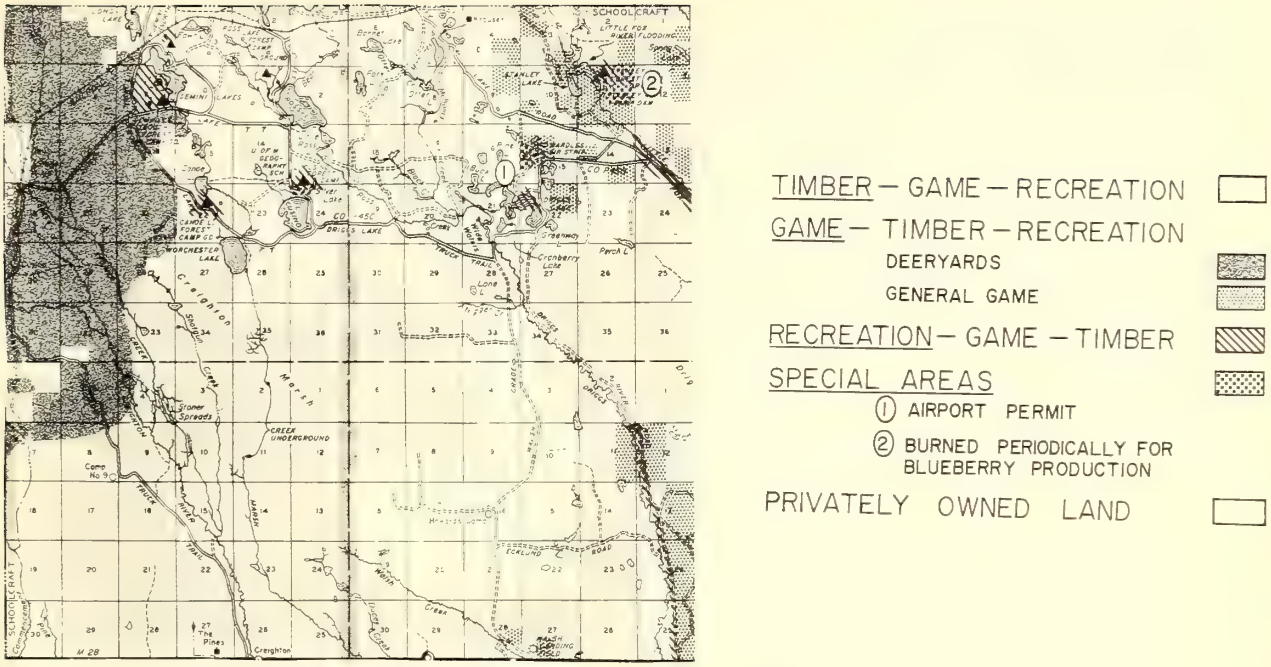

FIGURE 12. — Map depicts multiple-use management on a State Forest.

such a planned program exists and to serve as a guide in protecting certain high-value areas from encroachment by other uses.

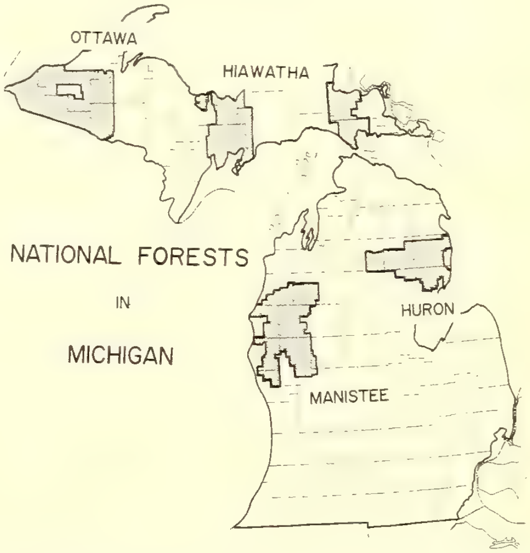

FIGURE 13. — Location of National Forests in Michigan.

National Forests

The National Forest system in Michigan dates back to 1909 when the Marquette and Huron National Forests were established through Presidential power to designate forest reserves from the public domain. Since little public domain remained east of the Plains States — only portions of National Forests in Alabama, Arkansas, Minnesota, and Florida, as well as Michigan were established from public domain lands — the acreage of National Forests in Michigan was naturally quite limited. The Weeks Law of 1911 provided for expansion of the National Forests by authorizing the purchase of land at the headwaters of navigable streams. Still later, in 1924, the Clarke-McNary Act extended the Federal land purchase policy to include lands necessary for the production of timber. But like the State Forest system, the Michigan National Forests did not begin to approach their present size until the 1930's when tax delinquency became common.

During the 10-year period 1930-40, the area grew from 94,000 to 1,965,300 acres. Since that time it has increased about one-third to where, in 1962, Michigan has 2,558,327 acres of National Forest lands in four Forests: the Huron, Manistee, Ottawa, and Hiawatha (fig. 13).

Gross area within the boundaries is 4,713,326 acres, but only 54 percent is federally owned. Two-thirds of the National Forest land is in the Upper Peninsula. Most of the area (63 percent) was tax-reverted lands which were purchased directly from the counties. Exchanges with other public agencies accounts for an additional 34 percent, much of which was probably tax-reverted also.

Timber Product Output from National Forests Is Increasing

The output of timber products from Michigan National Forests has been nearly the same as that from State Forest lands, although cutting activity on National Forests predates that on State land by about 10 years (fig. 14). Like the lands that the State "inherited," much of the cutover and burned-over land that comprised the National Forests could not support a commercial cut when acquired by the Federal government. As the acreage of the stands increased and the stands matured, the volume of timber products harvested from the National forests increased. In 1933 the total cut was 931,000 board feet, but by 1961 it had increased to 149.5 million board feet. Total receipts increased a thousand fold during this period, from $1,166 in 1933 to $1,009,364 in 1961.

Again, like the State Forests, the cut from Michigan's National Forests is mostly pulpwood. In 1961, for instance, 81 percent of the volume cut was pulpwood, while saw log products accounted for 10 percent; the remaining 9 percent was posts, poles, piling, and miscellaneous products. The output of pulpwood as a proportion of the total has remained fairly constant during the 1950-62 period. Sawtimber production has dropped and the output of miscellaneous products has increased. As the

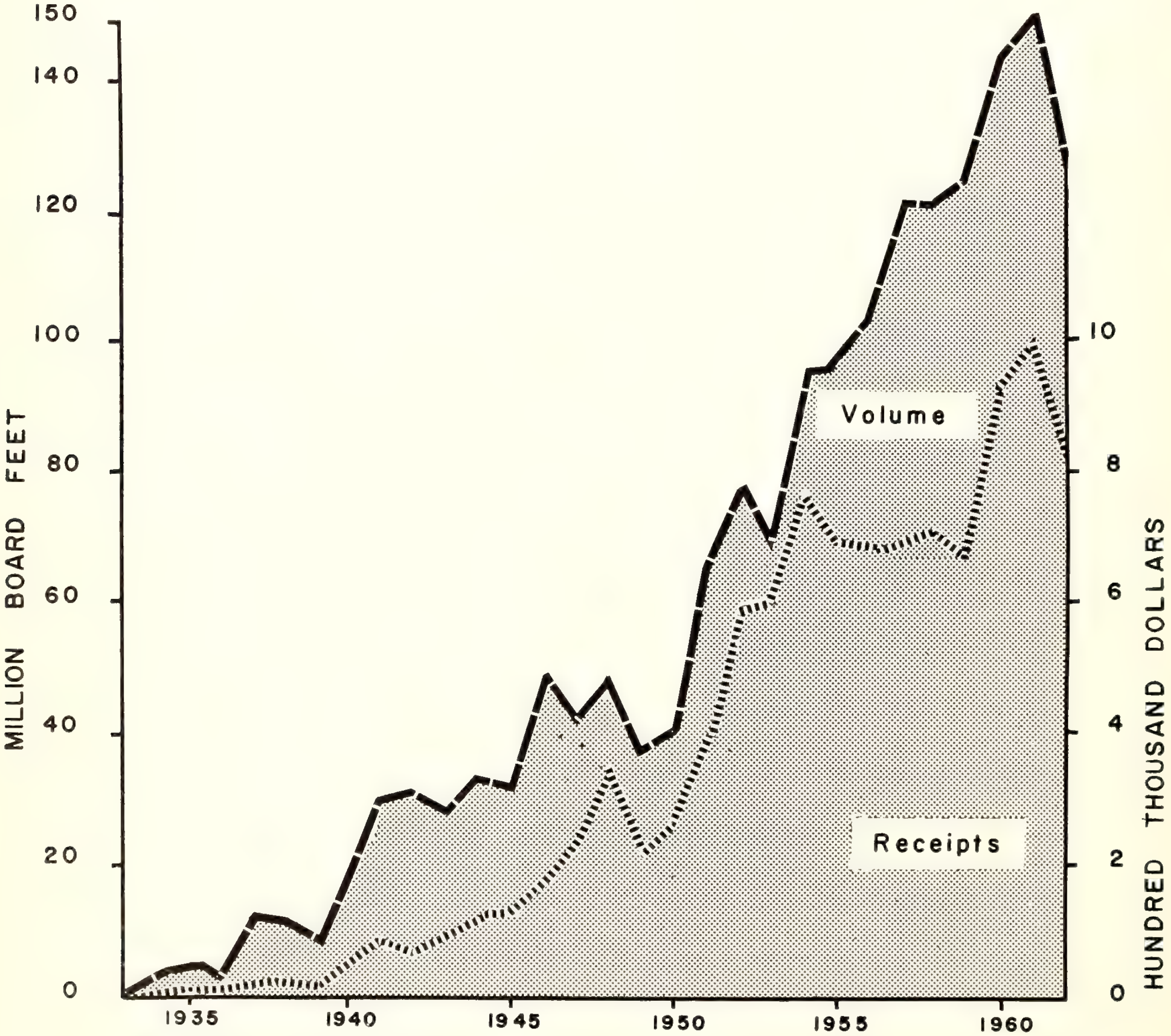

FIGURE 14. — Output of timber products from National Forests in Michigan, 1932-1962.

second-growth stands mature, however, we shall probably see more sawtimber harvested.

During the 1961 fiscal year 658 timber sales were made. These were classified by size as follows:

Size of sale	*Number of sales (percent)*
$300 and under	55.6
$301 - $2,000	30.4
$2,001 - 2,000 MBM	12.5
2,001 MBM - 5,000 MBM	1.5

The majority of sales, 55.6 percent, were for $300 or less. Only 10 sales involved more than 2,000 MBM but these accounted for 20 percent of the timber volume sold.

In addition to the timber sales there were 77 sales of Christmas trees, boughs, etc., with a value of $5,905.

Allowable Cut Still Exceeds Actual Cut

The allowable cut on the Michigan National Forests, like that of the State Forest system, represents the volume of timber that can be removed over a period of years while maintaining or building toward a desirable level of growing stock. The allowable cut, therfore, is a goal as well as a limitation. Allowable cut for a particular type depends upon the operable area of this type as well as its volume, since control is based on area, with volume as a check. The determination of the allowable cut is made from inventory data collected at 10-year intervals.

The flow of timber products varies by forest type. Some types exhibit fairly uniform areas by age classes and support a relatively even flow of material. However, there is a preponderance of young stands, so the allowable cut is much less than total sustained yield capacity. Under continued protection and management these stands will eventually produce the large volume of wood of which they are capable.

In 1962 the allowable cut from Michigan's National Forests exceeded the actual cut by 33.9 million board feet as shown below.

National Forest	*Allowable cut*	*Actual cut*
	(million	*bd. ft.)*
Hiawatha	56.8	29.5
Lower Michigan[1]	59.1	50.0
Ottawa	42.9	45.4
Total	158.8	124.9

[1] *Includes the Huron and Manistee National Forests.*

Looking at the individual forests, however, one sees that the Ottawa actually exceeded the allowable cut, while the Lower Michigan Forests came fairly close to meeting their goal — undercutting it by only 9.1 million board feet. It is on the Hiawatha where the significant disparity between allowable and actual cut exists. Here, in recent years, market conditions — particularly the lack of demand for aspen and dense hardwood species — have prevented full utilization of the allowable cut.

Present Planting Program Should be Accelerated

As of July 1, 1962, 444,105 acres of forest plantations had been successfully established on National Forest land in Michigan. Of this total, 329,224 acres or 74 percent were established between 1933 and 1942.

Tree planting was discontinued during World War II, and the acreage of successful plantations dropped because of losses from fire, insects, and the lack of maintenance. However, 10,343 acres were planted in 1947 and for the next 15 years an average of 7,500 acres were established annually.

If the planting goals of the National Forests in Michigan are to be met, the present planting programs will have to be accelerated. It is estimated that about 231,000 acres are still in need of planting.

Timber Stand Improvement Largely Sale Area Betterment Work

A large share of timber stand improvement is done as "sale area betterment" work, authorized by Knutsen-Vandenberg (KV) funds. The Knutsen-Vandenberg Act of June 9, 1930, requires that purchasers of National Forest timber make deposits of money in addition to the payment for the timber to cover the cost of, among other things, cutting, destroying, or otherwise removing undesirable trees or other growth. This Act also authorizes payments for regenerating stands and weeding, thinning, and pruning the ensuing young growth (fig. 15).

Through the 1962 fiscal year, 96,044 acres of forest land had been treated in the K-V sale area betterment program. Regular funds that may be used to complete high priority sale area betterment work are also available for stand improvement.

Forest Protection Activity Complements State Forest Programs

Forest fire, disease, and insect detection and control on the National Forests are much the same

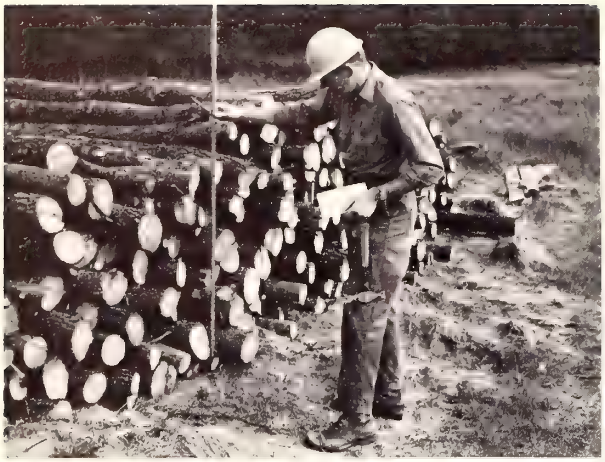

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FIGURE 15. — Scaling pulpwood harvested in thinning a young pine plantation. Thinning will become more common in Michigan's National Forests as the large acreage of pine planted during the 1930's reaches merchantable size.

as on the State Forests and are coordinated for efficiency. The risk of forest fire is becoming greater each year with more people using the forests and young coniferous stands maturing. Intensive prevention, detection, and suppression activities are necessary.

Success in reducing the incidence of forest fires on Michigan National Forests despite increased use is shown in the tabulation below:

Year	*Number of fires*	*Acres burned*
1952	233	1,073
1953	199	1,342
1954	158	341
1955	111	382
1956	77	143
1957	140	1,753
1958	165	764
1959	101	321
1960	75	432
1961	185	865

White pine blister rust has required extensive control. Efforts date back to 1932 when Civilian Conservation Corps and National Industrial Recovery Act labor was used to remove the rust's alternate host, ribes, from the proximity of white pine stands. Since this beginning, an average of approximately 5,000 acres of the white pine type have been treated annually.

To date about 80 percent of the 77,600 acres of the white pine type has been placed on a maintenance status. That is to say, ribes have been removed from the area to the extent that only periodic checks are necessary. Insect control measures have been carried out on 16,500 acres during the last 6 years.

Recreational Use Increasing Sharply

The Forest Service has for many years provided public facilities for camping, picnicking, swimming, boating, and hiking. Current trends in the number of recreational visits to Michigan's National Forests reflect a sharp increase in demand. Between 1950 and 1961, for instance, the number of visits increased five times (fig. 16).

Presently 185 recreational sites are maintained on the Michigan National Forests. As shown in the tabulation below, camping sites, picnic grounds, boating sites, and recreational residence areas account for most of these facilities:

Kind of site	*Number of sites*
Campgrounds	52
Picnic grounds	33
Boating sites	31
Recreation residence sites	29
Swimming sites	16
Other recreation sites	24
Total	185

In addition, the Forest Service also provides visitor information services, nature trails, and self-guided tours showing multiple use of a managed forest. Long-range plans call for additional facilities. It is estimated that the number of campground visitors in 1976 will be more than eight times the number in 1958. The use of picnic sites and winter sports areas will at least triple during this same period.

Multiple Use Policy Dictates Use of Michigan's National Forests

The Multiple Use Sustained Yield Act of 1960 was formal recognition by the Congress of the Forest Service policy of managing all of the basic resources found on the National Forests: outdoor recreation, range, timber, watershed, and wildlife. Each ranger district is zoned for multiple use management (fig. 17). It is impossible, of course, to provide for every use on each acre but over the district as a whole many uses can be made available providing the resources are there (fig. 18).

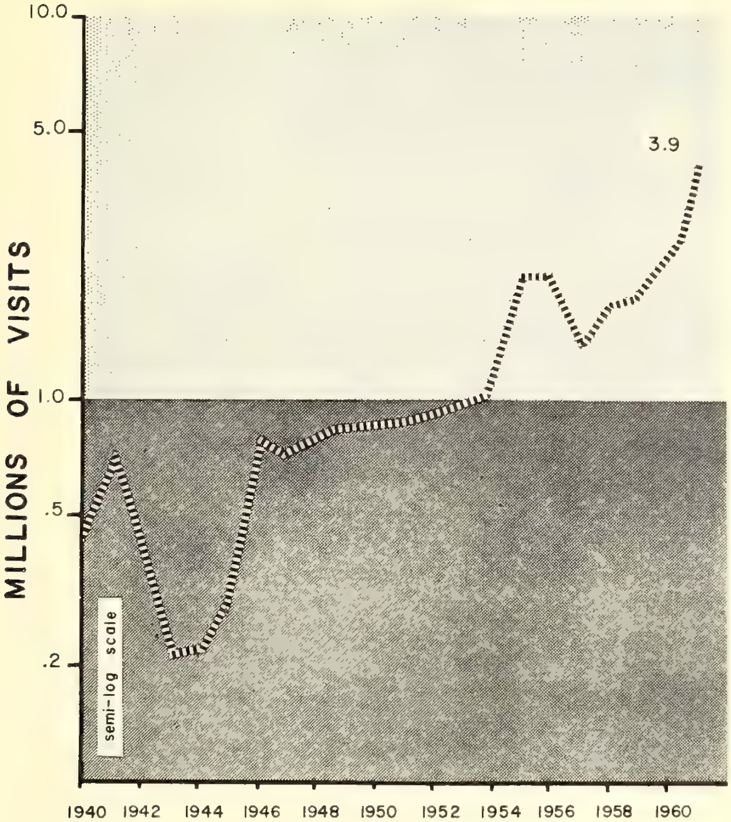
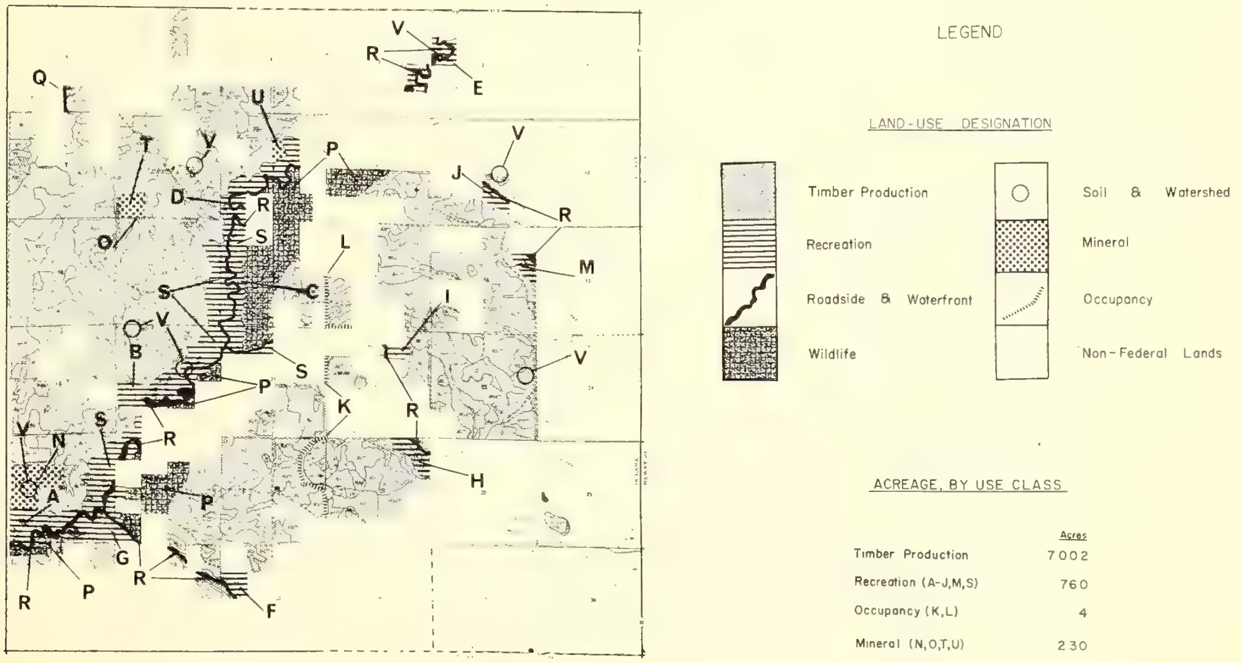


FIGURE 16. — Michigan National Forest recreation visits, 1940-1961.



ACREAGE, BY USE CLASS

	Acres
Timber Production	7002
Recreation (A-J,M,S)	760
Occupancy (K,L)	4
Mineral (N,O,T,U)	230
Wildlife (P)	572
Roadside & Waterfront (Q,R)	522
Watershed (V)	20

FIGURE 17. — Example of multiple-use management on Michigan's National Forests.

DISCUSSION AND CONCLUSIONS

That the various classes of forest owners in Michigan manage their timbered holdings in different manners is definitely shown. At one extreme are the woodland owners who generally, at best, can be described as "passive producers" of timber products — their forests grow in spite of their neglect or misdirected efforts — while at the other end of the scale are the public forest-land ownerships and several of the large private holdings. The management of public forests does not exactly represent the epitome of intensive forestry, because the level of financing precludes the adoption of many practices, but the State and National Forests as a whole are more intensively managed than any other major grouping of ownerships in the State. Although several of the large forest-land ownerships are being managed at a level at least commensurate with that of Michigan's publicly owned lands, some are not.

The difference in the kind and amount of forest management implemented by the various classes of owners over the years should effect changes of timber output from the different ownership groups. Although data limitations preclude an exhaustive demonstration, it can be shown that investments in management of Michigan's public forest lands are beginning to bear fruit.[6]

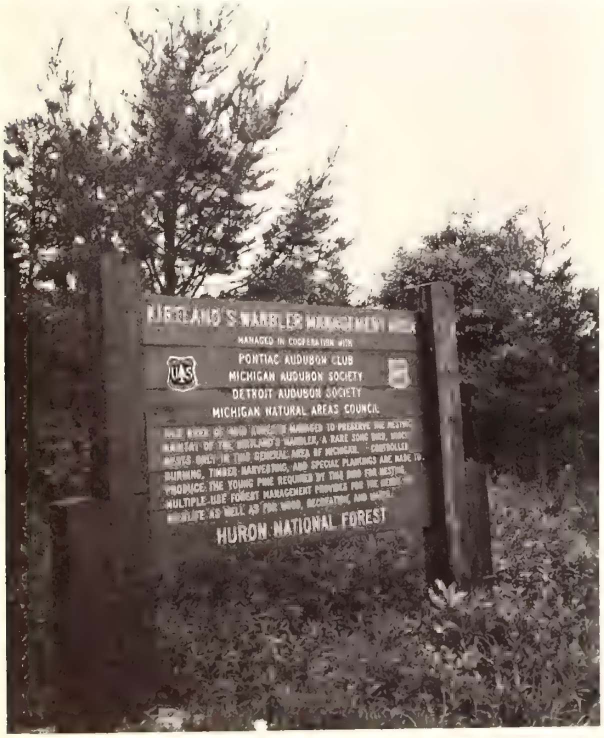


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FIGURE 18. — Multiple-use management of Michigan's National Forests assumes varied forms. For instance, the above sign explains how 4,010 acres of forest land is being managed to preserve the nesting habitat of the Kirtland's Warbler.

Timber Cut Decreased Between 1950 and 1960

The total cut of timber products from Michigan's forests decreased somewhat between 1950 and 1960 (fig. 19). This trend is opposite to the upward trends of timber volume and growth but, considering the changes in the market structure for various wood products during the period, such movements are to be expected. The demand for and the supply of hardwood lumber changed considerably because much of the old-growth timber had been liquidated. This is reflected in the change in composition of the timber cut during this period. The cut from sawtimber growing stock for other than pulpwood dropped by 50 percent to a level below that of the total cut of pulpwood products,[7] whereas the cut of pulpwood increased by nearly 25 percent. This increased demand for pulpwood, however, did not compensate for the drop in the demand for lumber.

A look at the contribution to the cut of raw wood products by the various classes of owners brings out some interesting trends. For instance, the cut from privately owned sawtimber growing stock for non-pulpwood products decreased from an estimated 129 million cubic feet in 1950 to 64 million cubic feet in 1960; the cut from public forest lands during this period increased nearly five times (fig. 20). However, the sawtimber cut from public lands still represents only a small proportion of the total cut of sawtimber from all ownerships.

The trends in the cut from poletimber and the pulpwood cut from sawtimber growing stock bring out the fact that not only did the cut from public

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[6] *Trend data on timber cut in Michigan are available for three classes of owners: State Forests, National Forests, and all private owners. Separate estimates for the small private and large private classes are not available.*

[7] *This and ensuing data regarding cut from Michigan's growing stock during the 1950-1960 period are based upon field enumeration and bookkeeping adjustments.*

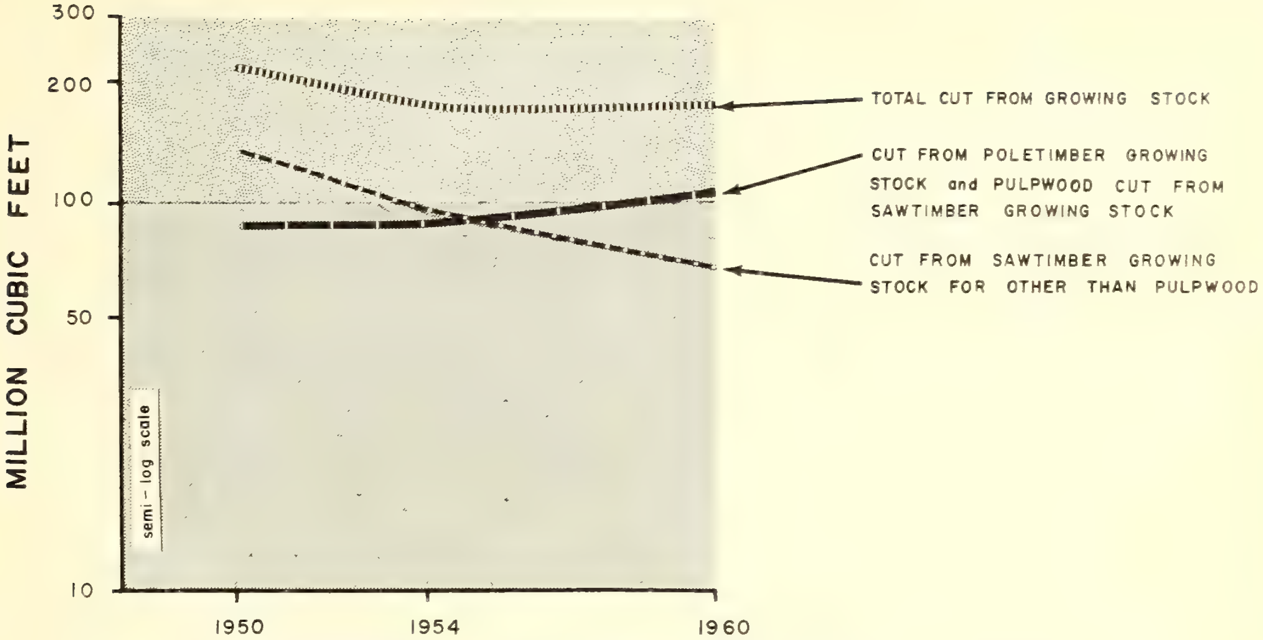

FIGURE 19. — Estimated cut from Michigan's forest growing stock — all products, all owners, 1950, 1954, 1960.

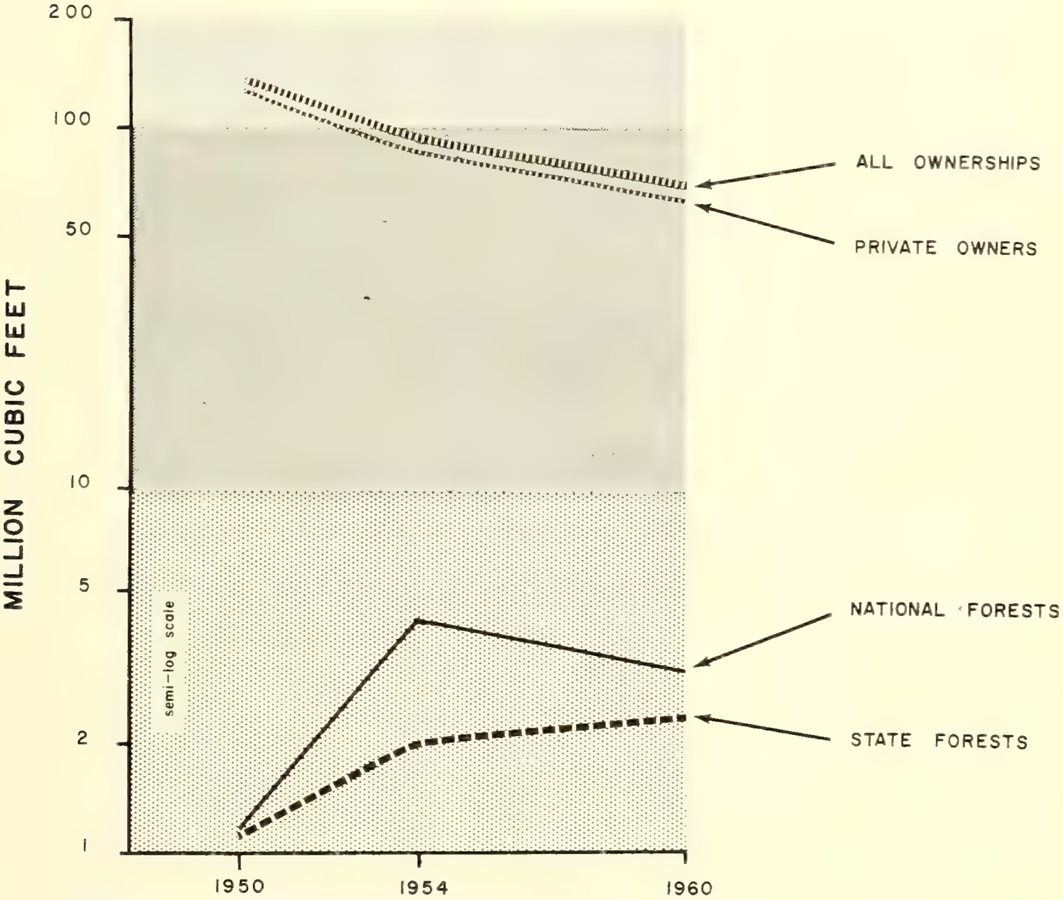

FIGURE 20. — Estimated cut from sawtimber growing stock for nonpulpwood products, by ownership, 1950, 1954, 1960.

lands more than double between 1950 and 1960 but also the cut from State and National Forests combined is beginning to make up a significant as well as an increasing share of Michigan's cut of roundwood products (fig. 21). Private owners on the other hand have increased their cut in recent years, but not enough to regain their 1950 level of output and share of the total market.[8]

Better Management and More Aggressive Timber Marketing Account for Public Forests' Increasing Share of Output

Now the question arises, "Why have the public forests been able to sell increasing amounts of sawtimber in the face of a declining market?" Likewise, "Why have the public lands been able to increase their output of roundwood products while private owners, in 1960, were not back to their 1950 level of roundwood production?"

Certainly one of the answers is more and better management. The quality and quantity of wood

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[8] *It is not possible to separate the large ownership cut from that coming from small ownerships. However, the contribution of roundwood products from the large ownerships probably increased during the 10-year period.*

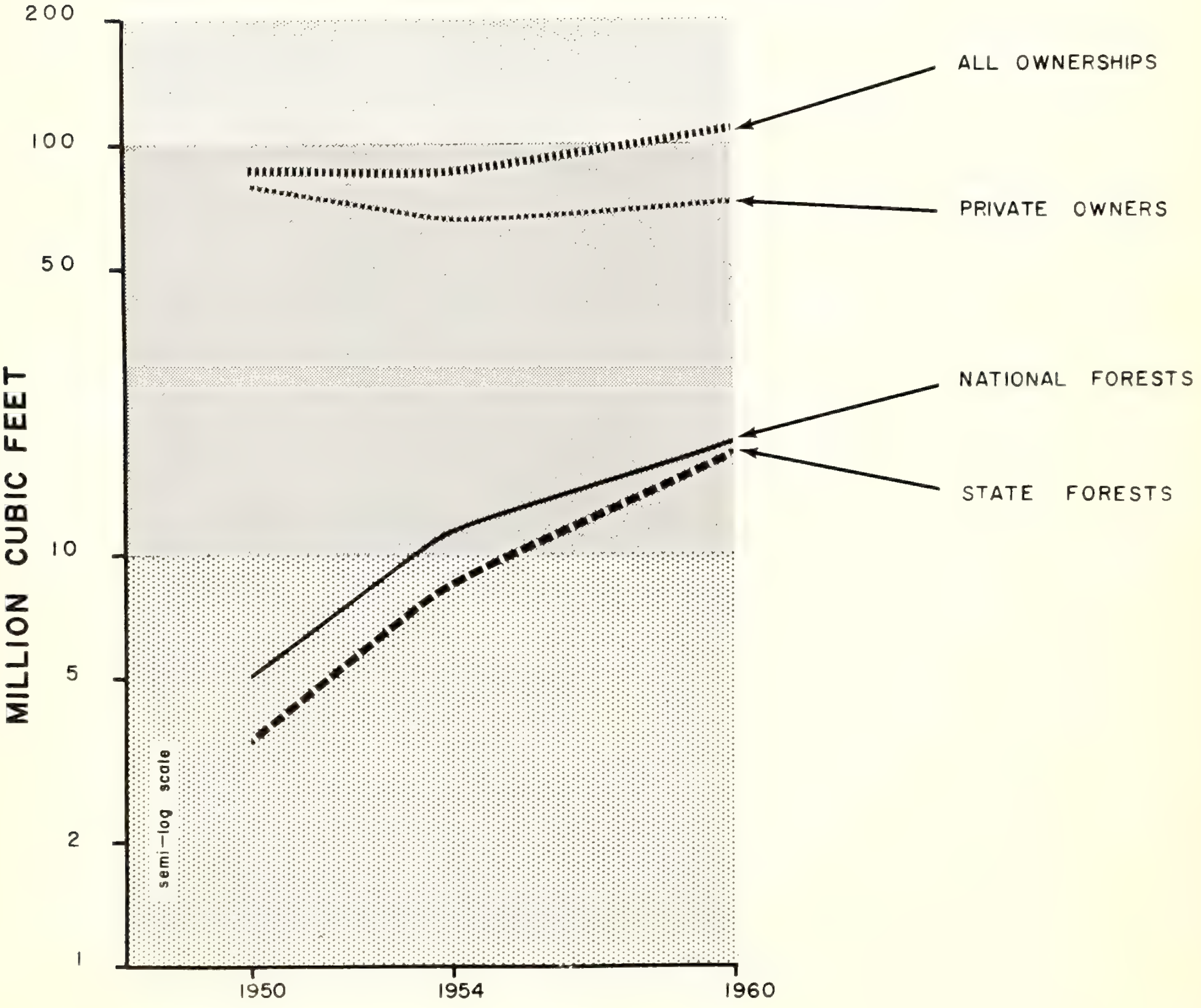

FIGURE 21. — Estimated cut from poletimber growing stock and pulpwood cut from sawtimber growing stock, by owners, 1950, 1954, 1960.

products have improved more on public lands than on private lands because timber harvesting from public forests is geared to a computed allowable cut designed to increase productivity.[9] Timber harvesting on the majority of small private holdings meanwhile has not been such as would enhance quantity or quality of output.

Still another reason for the increased output of timber products from public lands versus the decline from the private sector — and perhaps just as important a reason — is that public forest land managers "merchandise" their wood products whereas the private owner usually takes a passive interest in the prospects of selling wood. Public foresters are continually striving to promote the sale of the allowable cut on public lands, whereas the private owner usually waits until a buyer approaches him before considering a sale.

Public and Large Private Forest Lands Will Increase Their Share of Timber Output

The output of all timber products from Michigan's public forests quadrupled between 1950 and 1960, while the cut from private lands dropped by 32 percent (fig. 22). Although data are not available, the large private ownerships, like the public lands, probably increased their output of timber products during the 1950-60 period, since, as was pointed out earlier, the productivity of many large private ownerships was rated higher than that of public lands.

As a result of concerted efforts to increase output, public forests and large private ownerships will undoubtedly continue to increase their share of the total output for some time. But there is a limit to the contribution that they can make.

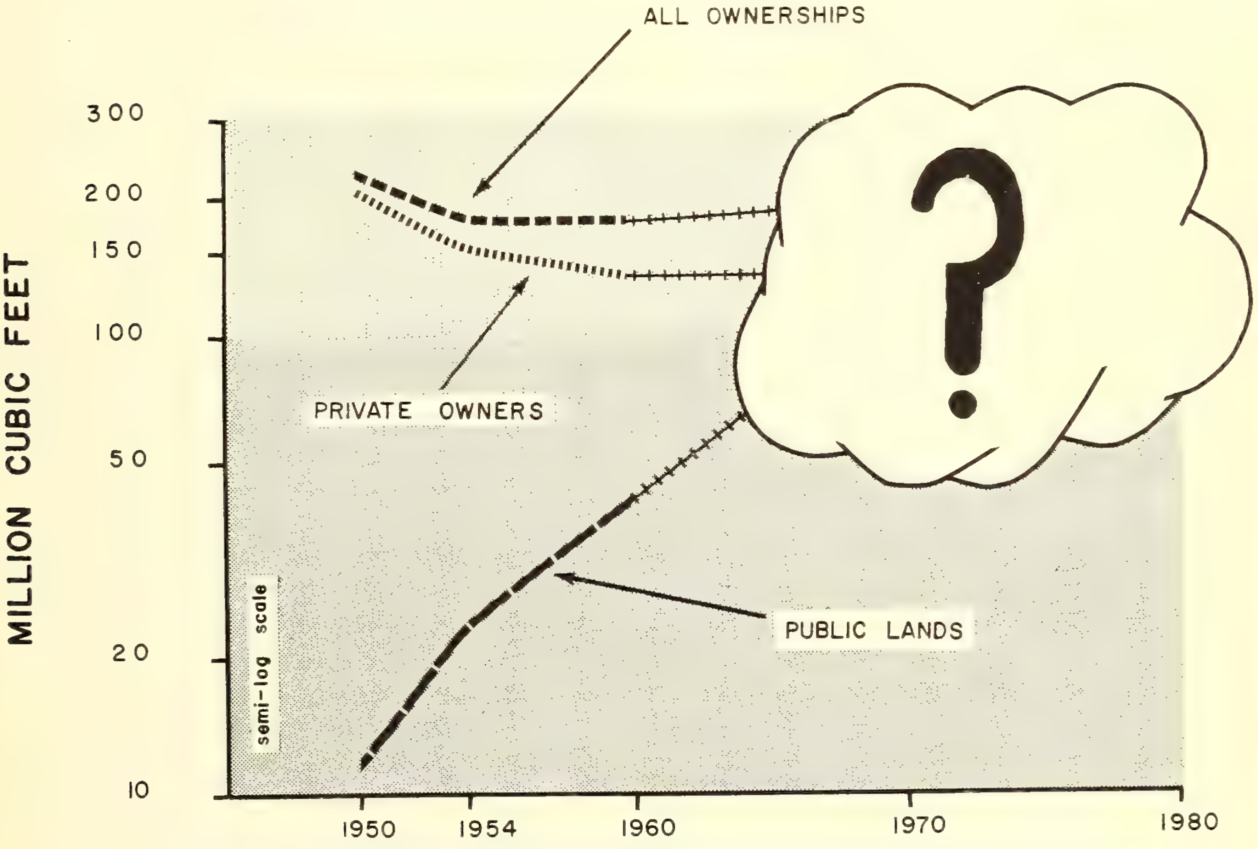

FIGURE 22. — Estimated cut from growing stock, all products and all owners, Michigan, 1950, 1954, 1960. Projected trend lines suggest that total cut from public lands will equal that from private forests by 1980.

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[9] *One might attribute the ability of public lands to increase their output mainly to the reduction of forest fires to a low level. But if this were the case private forest lands would also be supporting increased timber output because fire history of both private and public land has been essentially the same.*

It is apparent from figure 22 that the public forests' contribution to timber production has caused the total cut from all forest land to level off and show signs of increasing. But a projection of current trends to 1970 would show only a modest increase in the total output — from 178 million cubic feet in 1960 to 188 million in 1970. Total cut from private land would continue to drop despite a slight increase in private pulpwood production. The drop in saw log production would be greater than the upswing in pulpwood output. However, the cut from public lands would increase enough to more than offset the decrease in lumber output from private lands, to a point where public forests would be contributing more than their share, proportionate to area, of the total timber cut — 37 percent of the cut from 33 percent of the forest area. Assuming that current trends persist, the output from public forests would equal that of private owners sometime between 1975 and 1980.

The projected trend in cut from public lands would seem to be fairly realistic. Although public forests are presently selling less than their allowable cut, the doubling of the present output during the next decade and a half — which would occur if present trends continue — probably approximates the maximum under present standards of utilization. In addition, a doubling of the output would have to be accompanied by sizable increases in the number of public foresters to handle the added timber sale administration. All in all, it is the owners of small forest holdings who must be encouraged to improve their productivity if Michigan is to appreciably increase its timber output in the long run.

As just mentioned, extension of current trends in timber cut would find the private and public ownerships producing at the same level by 1980. However, Forest Survey estimates of future growth (Findell et al. 1960, p. 15) suggest that the *biological* potential of private forest lands would actually support more than twice as great a cut as the extension of current trends would indicate. Actually, instead of current trends persisting, we would expect the cut from privately owned forest land to increase more or less "spontaneously" as the second-growth stands mature, assuming, of course, that the owner desires to sell timber products. But it is doubtful that the contribution of the small privately owned forests will approach their potential unless steps are taken to encourage more of the owners to practice forestry.

Equi-Marginal Principle a Guide to Distribution of Inputs

The productivity of Michigan's forest resources could be increased in many ways, but greater benefits can be derived from certain opportunities than others. For instance, physically much could be done to increase the wood-producing potential of the small ownerships because so little has been accomplished in the past. But the mere existence of problems to be solved does not dictate the expenditure of funds and manpower. Conceivably, equipment and labor presently being used to plant trees on public forest land might achieve more in terms of increased timber values if expended on private lands. On the other hand, a reallocation of productive inputs might dictate their use to sponsor timber stand improvement activities elsewhere on public lands and not to plant trees on small private ownerships. Or it could be that some of these funds should be used to promote better forestry practices among a selected portion of small ownerships while the remainder be reallocated to timber stand improvement on public land.

These alternatives are hypothetical, but they demonstrate how decision-makers could approach the problem of maximizing the output of timber products from Michigan's forest lands with the funds available to them. We cannot maximize the returns to inputs as long as opportunities exist to shift inputs from one forestry endeavor to a more economically efficient one. Of course, there are political and institutional factors which inhibit the application of the equi-marginal principle. Funds are often earmarked by legislative bodies for particular practices, and funds are appropriated by both State and Federal units of government; but where possible, land, labor, and capital inputs could be allocated so that the marginal units are deriving at least as great benefits as could be obtained from alternative uses.

Certain Ownership Characteristics and Land Use Patterns Affect Timber Products Supply

A comparison of the allowable cut and actual cut from Michigan's forests seemingly reveals a timber surplus. In 1955, for instance, the total cut from all species and all owners was only 64 percent of the allowable cut. Although these estimates are not current, the discrepancy probably still exists — and is perhaps even greater since growth trends have been upward while production has leveled off in recent years.

The important question is, "How much of this disparity between allowable and actual cut goes unharvested simply because of a lack of markets?" In other words, is it realistic to assume that all of this volume differential would be marketed if the demand for timber products increased? As far as many of the large private ownerships and the public forests are concerned the answer may well be in the affirmative. However, when one considers inhibiting factors peculiar to the small ownership group, their potential to produce timber may not be much greater than current levels. For one thing, although they may not now be harvesting their allowable cut, traditionally they have overcut certain species and age classes, and so probably the difference between actual and allowable cut from small forest ownerships is less than from other classes of owners. Just as important perhaps, certain ownership characteristics and land use patterns inhibit, if not preclude, the marketing of some of their allowable cut (fig. 23).

The majority of small woodland ownerships are held for reasons other than timber production. This factor serves to restrain the flow of timber products. In fact, objectives of ownership are sometimes incompatible with timber harvesting. For instance, the recreation-motivated owner usually considers the psychic returns of land ownership ample justification for retaining his forest land; income from timber has little appeal. If this class of owner increases, the supply of timber products will be reduced unless owners can be shown that timber production is compatible with and in fact often enhances certain recreational values.

Another ownership characteristic that has a bearing on the trend in Michigan's timber output is absentee ownership (this type of owner, of course, is not mutually exclusive of the recreationist owner). Absentee owners are less apt to market timber products than resident owners. Unless the absentee owner contacts a buyer, it is difficult for the buyer and seller to come to terms. A timber buyer in the Upper Peninsula is not going to spend much time getting in touch with the owner of a 40-acre stand of aspen if the owner lives, say, in Detroit. On the other hand, the small return involved might not be enough to interest the owner in negotiating, in absentia, for the sale of his timber even if the buyer does make a contact.

Although absentee ownership could reduce the economic supply of timber in Michigan, there's another aspect of absenteeism that could ameliorate the timber drain situation. True, the absentee owners are physically separated from the timber market, but likewise they are usually less dependent upon their woodlots as a source of income. Over the long run, therefore, these two factors — distance and income source — could lead to less premature cutting and thereby improve the quality and quantity of timber growing stock. Conceivably, the conflicting aspects of absentee ownership could counteract one another.

Fragmentation of privately owned forest properties into smaller and smaller parcels is another feature of the Michigan timber resources that could also restrict the flow of timber products. We know, for instance, that in the Upper Peninsula there are now approximately 1 million more acres of forest land owned by the small ownership class than in 1935. A recent study in the north half of the Lower Peninsula shows that fragmentation has been occurring in that area.[10] Should the average size of privately owned forest property decrease appreciably, the incentive, from the standpoint of both the buyer and seller, to harvest timber from many properties might be significantly hindered.

Having much the same effect as fragmentation is the factor of urbanization. It has been estimated that, if population growth and economic activity are maintained, the annual rate at which private forest land in southern Michigan will shift to nonforest uses in the next decade will be approximately 1 percent (Schallau, 1962, p. 11). Of course, growing stock harvested or otherwise removed to make way for urban uses will no longer enter into the computation of allowable cut. But as was previously mentioned, urbanization can isolate blocks of growing stock from timber product markets, and then, despite the existence of merchantable timber volume, these stranded pockets of forest land would cease to be effective suppliers of timber products.

It may seem inconsistent to be concerned with factors that inhibit the flow of timber products from Michigan's forests at a time when timber markets are showing signs of weakness. On the contrary, when one considers the long-run and not just current movements, the discussion is quite appropriate. Building activity is cyclical, and it should only be a matter of time before an upswing will be reflected in the timber market place; this upswing, when coupled with a steadily increasing demand for pulpwood products, points toward increased wood requirements in the future.[11] The demand for wood stemming from building activity may assume different forms in the future than in the past, but there is little reason to suspect that Michigan will have a chronic oversupply of timber in years to come.

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[10] *A study of forest land fragmentation or consolidation in the northern half of the Lower Peninsula was conducted by the author during the summer of 1963. The results of this research will appear at a later date.*

Because allowable cut computations do not take the "inhibiting" factors into consideration, the present drain of forest products may be closer to the maximum possible than allowable cut-actual cut comparisons imply. Timber supply response information for Michigan is not available, and

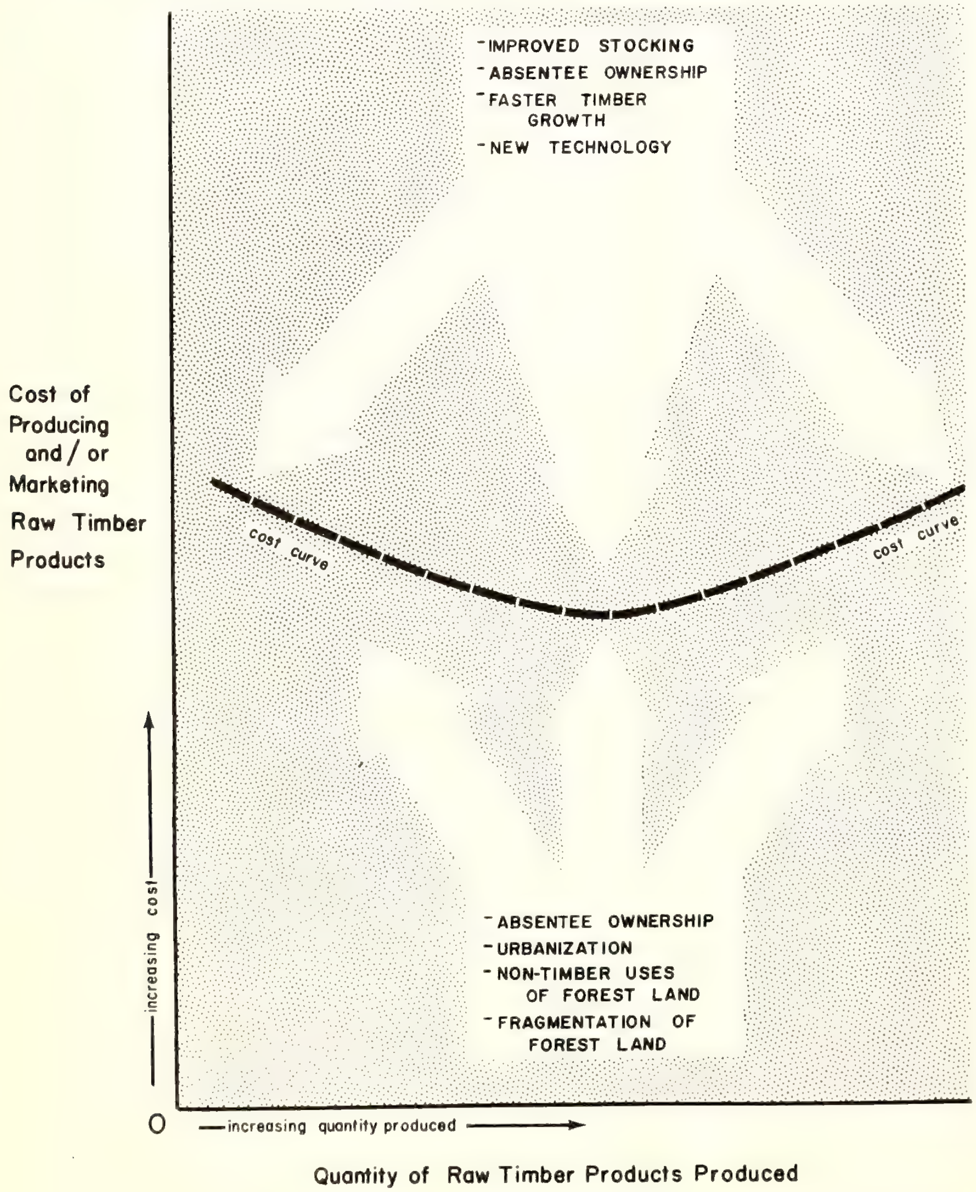
-IMPROVED STOCKING
-ABSENTEE OWNERSHIP
-FASTER TIMBER GROWTH
-NEW TECHNOLOGY
Cost of Producing and / or Marketing Raw Timber Products
cost curve
cost curve
increasing cost
-ABSENTEE OWNERSHIP
-URBANIZATION
-NON-TIMBER USES OF FOREST LAND
-FRAGMENTATION OF FOREST LAND
O
increasing quantity produced
Quantity of Raw Timber Products Produced

FIGURE 23. — This schematic drawing shows a number of factors and their probable effect on the cost of producing and marketing raw timber products from Michigan's forests. It is hypothetical and is only intended to indicate whether a factor is cost-decreasing or cost-increasing. Note that absentee ownership could conceivably increase as well as decrease production and marketing costs.

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[11] *In recent years approximately 30 percent of the saw log cut in Michigan has come from softwood growing stock. Much of this material (hemlock in particular) is manufactured for the building industry. Some of the cut from hardwood saw logs is used for flooring, interior trim, and cabinet work, but a large share goes into furniture. But since there is a close correlation between home formation and furniture purchases, even the demand for furniture saw log material is responsive to the building cycle.*

without it we can only speculate as to whether timber supplies will be adequate for the future. The existence of increasing volume and growth of timber resources — which Michigan exhibits — is not tantamount to increases in the volume of wood products harvested. Conceivably, certain "supply inhibiting" ownership characteristics and land use changes could negate the effects of increased growing stock volumes. This appears highly improbable for the State as a whole, but it is obvious that future timber product output, although a function of available growing stock volumes, will not vary at a one-to-one ratio with changes in physical timber supplies.

LITERATURE CITED

Barlowe, Raleigh.
1948. Public landownership in the Lake States. Mich. Agr. Expt. Sta. Special Bul. 351, 28 pp.

Findell, Virgil E., Pfeifer, Ray E., Horn, Arthur G., and Tubbs, Carl H.
1960. Michigan's forest resources. U.S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 82, 46 pp., illus.

Gevorkiantz, S. R., and Duerr, W. A.
1937. A yield table for northern hardwoods in the Lake States. Jour. Forestry 35: 340-343.

Kearns, Frank, et al.
1962. An economic appraisal of Michigan's State Forests. Mich. Conserv. Dept. Forestry Div. Tech. Publ. 2, 59 pp.

Michigan Department of Conservation, Forestry Division.
1962. Michigan forest pest detection program report for 1961, 28 pp.

Quinney, Dean N.
1962. Small private forest landowners in Michigan's Upper Peninsula. U.S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 95, 20 pp., illus.

Schallau, Con H
1962. Small forest ownership in the urban fringe area of Michigan. U.S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 103, 17 pp., illus.

Sparhawk, William N.
1929. The economic aspects of forest destruction in northern Michigan. U.S. Dept., Agr., Tech. Bul. 92, 120 pp.

Stone, Robert N., and Chase, Clarence D.
1962. Forest plantations of northern Lower Peninsula. U.S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 102, 7 pp., illus.

U.S. Forest Service.
1958. Timber resources for America's future. U.S. Dept. Agr., Forest Resources Rpt. 14, 704 pp.

Yoho, James G.
1957. Private forest landownership and management in the northern half of Michigan's Lower Peninsula. Mich. State Univ. Agr. Expt. Sta., Tech. Bul. 261, 56 pp.

Yoho, James G., and James, Lee M.
1958. Influence of some public assistance programs on forest landowners in northern Michigan. Land Econ. 34: 358-364.

Schallau, Con H.

1964. Forest owners and timber management in Michigan. Lake States Forest Expt. Sta., St. Paul, Minn., 39 pp., illus. (U.S. Forest Serv. Res. Paper LS-9)

Management of forest land in Michigan varies considerably among ownership classes. At one extreme are the owners of small privately owned woodlands who, for the most part, are passive producers of timber. At the other extreme are the managers of many large tracts who assume positive roles in producing and marketing timber products. Outdoor recreational values are assuming greater importance as a motive for land managers. Extremes in management of forest land are reflected in the level of timber production. Output from private lands has been decreasing while the cut from public forests is increasing. The latter, which as late as 1940 did not contribute much to the State's timber cut, accounted for approximately 24 percent in 1960.

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